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MEMORANDUM ON EDUCATION IN MYSORE.

BY THE EDITOR.

ABOUT the middle of last month, the Government of Mysore issued an important Memorandum on Education in the State. It deals fully with a Report submitted to Government by the Inspector-General of Education, and suggests lines of action in regard to various points of policy and organization raised by him. The main object of the Memorandum is the formulation of policy in regard to education generally. With this object, the Memorandum has been issued for public discussion.

Among the subjects discussed in the Memorandum are the following :—

Primary education and the right mode of developing it; Secondary education and the changes required in regard to it; reorganization of Technical instruction; Women's education and the need for remodelling it; Mahomedan education and the best ways of improving it; Education of backward classes; Panchama education; training of teachers; reorganization of the inspectorate; educational buildings; and matters relating to religious instruction, medical inspection of pupils, adult education, extention of the library organization, institution of a provident fund for teachers, etc.

The proposals embodied in the Memorandum are of a tentative character, being mainly intended to elicit public opinion on them. Three months time is given to educational associations, aided agencies and the general public for formulating their definite suggestions on the same for the consideration of Government.

The following is an official summary of the Memorandum, which we print as issued to the public :—

The policy of vigorous expansion of Education in all grades inaugurated in 1913 has resulted in considerable development in all directions and has doubled the expenditure on Education in the last quinquennium. The Dapartmental Organization has been neither expanded nor improved in proportion to the rapidity and magnitude of these developments with the result that it is becoming increasingly inefficient and unequal to the task. In order to derive benefits commensurate with the number and variety of educational institutions and the amount of expenditure incurred it is necessary to review the lines of development in the past, take stock of the progress attained and lay down a policy for the future. A Memorandum on the subject was promised by the Dewan at the last Session of the Representative Assembly to focus public attention and awaken their interest in these problems and invite their co-operation in finding satisfactory solutions for them. The Memorandum deals with the present condition of Education in the varions grades giving a brief historical retrospect and suggests tentatively the various measures to be adopted for the

improvement of Education in the State in order to consolidate the results already achieved, to secure greater correlation between the various grades of Education in courses and curricula and place future expansion on a firm and solid basis.

The half salary grant-in-aid schools introduced in 1914 to which class nine-tenths of the Primary Schools in the State belong have some very grave defects, *viz.*, inefficiency, uncertainty of continued existence due to the poor emoluments paid to the teachers and the unwillingness of the villagers to pay contribution, want of equipment in the schools, and inadequacy of the teaching and inspecting staff. The proposals in the memorandum lay special stress on the improvement of Primary Schools. They are briefly:—

(i) The conversion of all aided Primary Schools into Government institutions with a view to establish 10,000 Primary Schools in the State so as to have one Primary School for every unit of population of 600 persons in the State and every unit area of 2·9 sq. miles.

(ii) Improvement of the efficiency of these schools by developing all the Primary Schools to the highest, Primary standard, namely, the III Vernacular Standard or the fourth-year course in the Vernacular, by providing them with a number of teachers proportionate to the number of pupils in the ratio of one teacher to every thirty pupils.

(iii) By granting a minimum scale of equipment for every Primary School and by the provision of trained teachers.

(iv) By distributing the schools entirely on the basis of population.

(v) By providing an adequate scale of Inspectorate at the rate of one Assistant Inspector, a trained graduate on Rs. 75—10—125 for every 100 Primary Schools.

(vi) By revision of curricula with a view to introduce systematic instruction in Kindergarten methods and nature study.

The scheme of compulsory education is at present introduced entirely at the cost of the State Revenues without any financial co-operation from local bodies. On the one hand this leads to unequal development of education in urban and rural areas and on the other hand further extension involves considerable expenditure to the State. In the Memorandum it is therefore proposed to afford equal encouragement to education in urban and rural areas by transferring control of primary education to local bodies and limiting the Government contribution for primary education in each local area according to a provincial scale based upon population, namely, two-thirds of the recurring charges on establishment and one-half of the non-recurring expenditure on buildings and equipment. To meet the large additional expenditure involved in adopting the above policy it is proposed to augment the resources of local bodies by making over to them a fraction of the local cesses on the land revenue and excise which are not now given to them and they will be further empowered to raise local cesses for educational purposes. The Government share of the expenditure will be met partly by enhancing the present allotments on Primary Education by the proposed income-tax as requested by the Representative Assembly.

At present the Middle Schools in rural areas are purely vernacular Middle Schools, Anglo-Vernacular Middle Schools being mostly located in urban areas. It has, therefore, been considered necessary to remove this disability and to create facilities for the higher education of the rural classes. The chief reforms proposed for Middle Schools are the introduction of one uniform type of

Middle Schools for rural and urban areas with vernacular as the medium of instruction and English as a second language, the increase of the number of Anglo-Vernacular Schools to 600, the introduction of practical instruction and elementary science into the curricclum, the revision of the Anglo-Vernacular course to one of four years, the provision of Government Hostels on the self-supporting basis, of private hostels on the grant-in-aid basis and the abolition of fees in Middle Schools if practicable.

The long-needed reforms in High School education are the improvements of science teaching, the introduction of the Polytechnic types of schools and of a better system of acquisition of knowledge and of training of the mental faculty by the adoption of the vernacular as the medium of instruction in a larger number of subjects. It is proposed in the memorandum to improve the accommodation for science teaching by the construction of Science Halls, to improve efficiency of teaching by the recruitment of more qualified staff and to improve the equipment of the laboratories. It is also under contemplation to raise the standard of instruction in science in the High School classes by the introduction of elementary science in the Middle School course so to prepare the pnpils for a higher standard of instruction in science.

To give a practical bent to education and at the same time afford industrial and technical training to the pupils it is proposed to remodel the scheme of studies in the High School courses so as to correlate it to a well-ordered scheme of technical instruction combined with literary education. The practical instruction according to nature study and kindergarten methods in the primary classes will be followed by elementary agricultural and industrial training in the Middle School course to be followed in its turn by the comparatively advanced industrial and agricultural training in the High School classes. The scheme of studies in the Agricultural School, Commercial School, Mechanical Engineering School and the Chamarajendrā Technical Institute will be adjusted so as to provide in these institutions opportunities for further practical training to the students of the High Schools who discontinue their literary studies after the High School course.

As regards the controversial question of medium of instruction in High Schools the arguments that should be considered in connection with the question have been focussed together in the memorandum. No solution is suggested for the present but it is pointed out that the difficulty in introducing the reform due to diversity of languages does not exist in Mysore.

The re-organization of Technical Instruction in Mysore has been taken up for detailed consideration. The causes of the failure of the existing industrial schools in improving the several industries have been traced to the low scale of expenditure, the want of competent teachers, the inadequacy of the equipment and to the low standard of general education of the pupils that resort to the industrial schools. The reforms suggested in the memorandum are therefore the gradation of industrial cources into elementary and higher in the Taluk and District Industrial Schools respectively, the drawing up of syllabuses suited to each grade, the introduction of art instruction in the Industrial Courses, the provision of Central Training Classes for teachers of industrial schools, the provision of a liberal scale of equipment, revision of the scholarship-rules, the opening of Trades Schools for manual industries, the training of pupils in business methods, the organization of tbe Home Industries Classes, and the correlation of the scheme of training in Industrial Schools to the industrial and technical training imparted in the Middle School and High School Courses.

In the case of Women's education the causes that retard progress have been

analysed and the measures necessary to extend it considered. It is proposed to treble the number of primary schools for girls and to afford greater encouragement to their higher education. Women's education is proposed to be remodelled so as to impart to a pupil before the age of withdrawal from schools the maximum amount of education possible without encumbering the advanced studies of the small minority who proceed to the University Courses. The introduction of subjects which are of immediate use to the girls in the position in which they have to occupy in the household in later life has also been proposed. Special efforts are being made to staff girls' schools with qualified women-teachers. A separate Inspectorate for girls' schools has been organized. A scheme of scholarships for the Secondary Education of Girls has been sanctioned. To provide qualified assistant mistresses and women teachers of primary schools a scheme of opening Normal Schools for women teachers has been proposed. The question of making vernacular the medium of instruction has been discussed as being of more immediate importance to the education of girls in view of the special customs requiring their early withdrawal from schools.

The education of Mahomedans requires immediate attention being given to the improvement of the efficiency of schools by the appointment of more qualified staff, better accommodation and special means of encouragement. Though the number of schools is adequate to the population yet all the defects pointed out above in dealing with the grant-in-aid policy are intensified in the case of Hindustani Schools. The courses and curricula require improvement. Special arrangements are necessary for the training of teachers. The memorandum suggests for consideration whether the avowed disadvantages of the system of schools exclusively for Mahomedans may not be removed by their amalgamation with the Anglo-Vernacular Schools with special arrangements for teaching Urdu. This would release large resources for giving scholarships to pupils of that community. This reform is in fact suggested by the preference shewn by enlightened members of the community to the Anglo-Vernacular Schools. The education of Mahomedan girls is attended with special difficulties peculiar to the Ghosha system. The only remedy within the range of practical politics is to provide the Hindi Girls' Schools with qualified mistresses and pay special attention to and afford special facilities for the training of the mistresses.

The memorandum proposes the continuance of the liberal scheme of backward classes scholarships instituted for all grades of education. The abolition of fees in Middle Schools which is under consideration will also have the effect of releasing larger resources for scholarships for the higher education of these classes.

The proposals made in the memorandum regarding Panchama education relate to the increase of the number of Primary Schools, utilisation of the Central Boarding Schools as institutions for training teachers for the primary schools in a larger measure than at present, the contiuuance of the liberal scale of scholarships and other inducements and allotment of special funds for further expansion. The combination of industrial training with literary education advocated in another portion of the memorandum has been already effected in the case of Panchama Schools.

One grave defect of the scheme of increasing the grant-in-aid schools by leaps and bounds, namely, the inefficiency of the staff was aggravated by the utterly inadequate arrangements made for the training of teachers of Primary Schools. A scheme of opening eighty training classes for such teachers has been proposed in order to train teachers adequate to the number of aided schools taken over under Government management. A training in the Normal School is, however, prescribed for Head-masters of

Primary Schools and Assistant Masters of Middle Schools.

To improve the efficiency of the Inspectorate it is proposed to appoint an Assistant Inspector on Rs. 75—10—125 for every 100 Primary Schools, to increase the pay and prospects of the District Inspectors and abolish the Circle Inspectors of Education their functions being delegated to an Assistant to the Inspector-General of Education of the rank and status of a Circle Inspector. It is also proposed to improve the pay and prospects, the qualifications and efficiency of the entire educational service aud make appointments in the tutorial line interchangeable with those of the same grade in the Inspectorate to prevent either set of Officers falling into a groove and the narrowing of their outlook.

As regards educational buildings the memorandum explains the policy recently inaugurated by Government of revising the type-designs to make them cheaper, to have a programme of building construction prepared in advance, to set apart a sum of Rs 3½ lakhs per annum for the purpose to be worked out as far as possible on the grant-in-aid basis and to encourage private effort to provide buildings on a guarantee of long leases. The policy of making grants to local bodies responsible for Primary Education for the construction of buildings has been advocated in view of the proposed transfer of control of elementary education to them.

Among other matters dealt with in the memorandum are the improvement of the scheme of adult education, of direct religious and moral instruction, of the Medical inspection and physical culture of pupils, the extension of the library organization in the State, the institution of a Provident Fund for aided institutions and the publication of text-books in Kannada on subjects of modern knowledge.

The memorandum has dealt with the cardinal problems relating to the improvement of the existing educational organization and the future expansion and development of education on sound lines. The forecast works out to a recurring expenditure of Rs. 68 lakhs per annum, an increase of one hundred per cent on the total expenditure in the current year. The task is a stupendous one and the increase of expenditure in proportion enormous. Ways and means have been suggested for meeting nearly half the proposed increase and it is hoped that the other half could be found without unduly straining the resources of the State. The proposals made above are tentative and are subject to revision in the light of criticisms and suggestions received. The final shape and actual working out will depend to a considerable extent on the ability of the local bodies to undertake the responsibilities proposed in the memorandum.

The United States Geological Survey, in its latest Reports, gives the total gross weight of all grades of Chrome ore produced and shipped in the United States in 1918, as 79,000 long tons, equivalent to 63,000 long tons of ore of 50 per cent grade. There were about 700 owners of domestic Chrome deposits in 1918, of which only about 270 actually shipped and marketed their output.

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The Norwegian Paper Mills have stopped working, wholly or partially, chiefly on account of the new restrictions on paper imports into England. Hardly any mills have orders in hand. It is said that the English restrictions will be withdrawn in six or eight months' time, bnt long before then all the Norwegian paper industries will have to close down.

PROGRESS OF AGRICULTURE IN MYSORE.

BY H. V. KRISHNAYYA, B.A.,

Officiating Director of Agriculture in Mysore.

IN common with the rest of India, Mysore is so largely agricultural, that the question of the improvement of agriculture in the State cannot but be a subject of predominant and perennial interest. It may perhaps be useful if an attempt is made to take stock of what has been done so far and to suggest what may be done during the next few years in furtherance of this object.

The question of creating a separate department which should solely concern itself with agricultural improvement has long been engaging the attention of the Government of India. It would come prominently into notice in times of famine and recede into the background when the stress was relieved; but no practical action was taken until 1891 when Dr. Voelcker submitted his report on the "Improvement of Indian Agriculture" containing the result of an exhaustive enquiry made by him during the previous year at the instance of the Secretary of State for India. Discussion of his proposals led to the decision that the time had come for the appointment of an expert for the scientific investigation of problems connected with Agriculture. An Agricultural Chemist and an assistant were accordingly appointed in 1892. The first Inspector-General of Agriculture was appointed in 1901 but it was not till some years later that the scientific staff was strengthened by the appointment of a Mycologist and an Entomologist.

The development of an agricultural policy in Provinces has been on similar lines. A few words may, however, be said about Madras in particular as it has, on account of its proximity, had a good deal of influence on the course of events in Mysore. Perhaps *nothing impresses a new comer in India*, especially if he is interested in such matters, so strongly as the comparatively low standard of life of the Indian agriculturist and the crude and primitive appearance of his appliances; and it is not surprising, if he should be led into the belief that the salvation of Indian agriculture lies in the wholesale importation of implements and practices from advanced countries. A full set of agricultural implements was got out from England and made over to the Saidapet Agricultural Farm which started work with a very ambitious programme. The raiyat did not take to these implements kindly and at the end of seven years, things had not moved forward appreciably. Then followed a period of reaction when nothing was done and the view was held in some quarters that the raiyat was conservative and did not know what was good for him and in others that he knew his business so well that there was very little that he could be taught. Attention to scientific agriculture in Madras may be said to date from 1901 when a farm was opened with the object of finding out varieties of sugar-cane resistant to "red rot".

Mysore was not slow to take advantage of the Saidapet College to which were sent students with scholarships for training. These men when they passed out were appointed to the Revenue Department and were expected to improve the agricultural practices of the country. The results were disappointing and, in course of time, these specially trained men were absorbed in the general establishment of offices. The desire to give a forward impetus to agriculture by the introduction of Western methods and appliances also gripped us and a goodly number of foreign implements were imported about this time. It was not uncommon in the very early days of the department to be asked to find use for implements, some of them weird looking and of a by-gone type. We have had our period of stagnation too as

in other parts of India. The foundation of the Agricultural Department in Mysore was laid towards the end of 1898 when Dr. Lehmann was appointed Agricultural Chemist and the Laboratory attached to the Geological Department was handed over to him for scientific work. It was not until 1905, however, that the Hebbal Farm commenced its existence.

Agriculture is peculiar as it is not a science in itself but is very intimately related to others so that not one but a number of scientific officers are required for the proper conduct of work in an Agricultural Department. It should also be remembered that the executive district staff at this time consisted of two Agricultural Inspectors for the whole of the State. During this period therefore sufficient attention could not be given to district work but a good deal of necessary and valuable work was done in organizing the work of the Farm and the Laboratory.

As the result of representations made from time to time, a Mycologist and Entomologist was appointed in the latter part of 1907; but as the engagement of the Agricultural Chemist with the Government terminated about this time, the prospect of a fully staffed department did not come any nearer. The order of 4th May, 1912, sanctioning the organization of a department of Agriculture with Dr. Coleman as the First Director marks an epoch in the history of agricultural development in Mysore. It may be of some interest to examine what the department has been able to achieve during this period of five years that it has been working with a not hopelessly inadequate staff.

An increase of agricultural production may be brought about in the following ways.—

A.—1. By increasing the area under cultivation.

2. By providing irrigation facilities in tracts where rainfall is precarious or scanty.

B.—By increasing the outturn per acre—

1. By the introduction of higher yielding varieties of seed.
2. By the introduction of better cultural methods.
3. By the use of fertilizers.
4. By the control of fungus and insect pests.

C.—Indirectly by improving the economic condition of the raiyat—

1. By the substitution of money crops for cheap crops.
2. By providing cheap capital.
3. By the spread of agricultural education.

The above list does not profess to be exhaustive but it is believed that nothing of much importance has been omitted.

A.—The increase of area under cultivation depends upon factors like the density and the economic condition of the agricultural population and the encouragement of colonisation wherever necessary is an administrative question. Dr. Smeeth has recorded his opinion that conditions are such in Mysore that the supplies of water we can reasonably hope to obtain from wells will, as a rule, suffice only for legitimate domestic purposes but will not stand being wasted or diverted to other uses—such as the growing of garden crops. The chances of effecting an improvement in irrigation facilities would, therefore, seem to lie mainly in the direction of the construction of new irrigation works and improving tanks and this subject is receiving the continuous attention of a special department of the State.

B.—The measures under B on the other hand may be said to fall within the scope of the legitimate work of an Agricultural Department.

1. *The seed ordinarily sown by the raiyat* is a mixture and the first thing that should be done is to separate pure types, some of which may possibly yield more heavily than the mixture or possess some special characteristic like resistance to drought. As the result of work along these lines done with regard to *ragi*, the principal cereal crop of our State, several pure types have been isolated and the distribution of these improved strains has been going on for the past two years. At the end of the present sowing season seed sufficient for 8,000 acres of a strain which has been found to give a 30 per cent higher yield will have been distributed.

Comparative trials with a number of varieties of sugar-cane showed that Red Mauritius gave about 30 per cent higher yield than any of the local varieties, also that it flourished under varying physical conditions. Seed of this variety sufficient for 250 acres has been distributed up to date and its cultivation is spreading with encouraging rapidity.

Besides tbis, a great deal of work has been done on paddy but experimental work has not progressed sufficiently far to admit of an extensive distribution of improved seed just yet though the prospect of our being able to do so in the near future is bright. Considerable work has in addition been done with regard to the introduction on a restricted sale of improved seed of special crops like castor, groundnut, tobacco, turmeric, etc.

2. The use of the improved plough besides enabling the raiyat to cultivate more land more efficiently and in less time than the indigenous implement leads to greatly increased yield on dry land as experiments on the Hebbal Farm have shown. The scope for the introduction of improved implements is very great and attention was therefore given early to this question. But the war conditions which have prevailed over the period under reference have not only raised the prices of these implements but also made it extremely difficult to get stock sufficient to *meet the demand. Five thousand* ploughs and cultivators have, however, been sold up to date.

The practice of transplanting single seedlings of paddy is being brought to the notice of cultivators in areas where broad-casting is the rule as it is found to produce better yields besides saving seed. The planting of cane also at wider intervals than what is usual in Mysore is for similar reasons being advocated. As a result of the work of the Department a large number of raiyats are now "selecting" the seed either by earhead selections or by the salt water method.

3. The use of improved implements and methods leads to heavier yields and consequently to a heavier drain on the soils of their valuable constituents. If the fertility of the land is to be maintained at a profitable level, the plant foods removed will obviously have to be made good by their addition in the shape of manures and fertilizers. This consideration will make it clear why any measures for increasing the outturn of land to be quite successful should be accompanied by measures for making available to the raiyats, manures easily and at reasonable cost.

The manure which the raiyat can most easily get and therefore which he commonly uses is cattle manure. This material contains all the foods necessary for plant growth and when preserved under proper conditions forms a very valuable manure. But as ordinarily stored, it is exposed to sun and rain and loses some of its useful ingredients. Its value is further discounted by the fact that the urine of cattle which is rich in plant food is allowed to run to waste. There is also the pernicious habit to be considered which is prevalent not only in Mysore but in other parts of India of burning cattle dung as

fuel. Dr. Coleman estimates the loss due to the improper storage and misuse of cattle manure at a hundred lakhs per annum. Stated in this way, the matter appears important enough to engage our serious attention. The department has from the beginning been teaching people how best to conserve cattle manure; there has been some progress but it has not been as rapid as one would wish.

The practice of green manuring which is a comparatively cheap method of improving and enriching the soil is not new to Mysore. It is prevalent in some parts in connection with the cultivation of paddy. The Department has made considerable progress in extending this practice in parts where it was previously unknown and to *ragi* cultivation in suitable areas.

With a view to popularise the use of oil, cake for Sugar-cane which responds readily to application of nitrogenous manures, the department has been purchasing and selling oil cake to cultivators on credit since 1915. This system has been greatly appreciated and in spite of the increasing price of oil cake 2,237 tons have been issued up to date. This work is, however, likely to suffer a serious check on account of the high cost of oil cake at the present time. This high cost of oil seeds and the cake is an effect of the abnormal conditions set up by the war which has cut off all outside supplies of artificial fertilizers and has obliged the large planting industries to turn to oil cake as the source of their nitrogen. These industries know the value of this fertilizer and will buy it in spite of high prices while the average raiyat has neither the inclination nor the ability to compete with them for the oil cake. The effect is that a large portion of the oil seeds grown and of the cake produced in the State find their way outside the State. The war is happily now over and the imports of artificials into the country will probably be soon restored. As a result of the extra installations that have been put down in the course of the war for utilizing nitrogen from the air, for the manufacture of explosives, the price of nitrates may also go down appreciably. Other things being equal, artificials being more concentrated will be preferred to oil cake which is bulky where transportation over long distances is involved. The outside market for oil seeds may for these reasons be expected to grow dull after some time and if some time their production in the State is stimulated, and an adequate number of oil-pressing installations are put down, the price of oil cake may come within reach of the average raiyat.

A mixture of bone meal and oil cake for paddy has been under trial for some time and the results obtained have been so encouraging that this manure will be distributed on a more extensive scale during the season.

The discovery of mineral phosphates in Mysore has not been reported and bones therefore form the chief source of phosphatic manure. The exports of raw hides and skins have been steadily rising during the past few years and as there are no indications that bone manure is used to any very great extent in the State, the large quantity of bones produced is either wasted or exported. As stated already, bone meal has a beneficial effect on paddy. Efforts therefore should be made to keep and utilize this within the State. The question of installing bone crushing plants deserves consideration in this connection. The manufacture of sulphuric acid if at all commercially feasible, would also help in the production of phosphatic manures in more easily assimilable form.

4. Soon after his arrival in Mysore, Dr. Coleman directed his attention to the investigation of *Koleroga* which had been playing such havoc in the areca growing areas of the State. As the result of long and laborious work in the Laboratory and the field, an efficient method of controlling the disease has been evolved and has found favour among the arecanut growers. The

life histories of the *Jola* grass-hopper and the *Kamblihulas* have been worked out and effective remedial measures recommended. The Pest Act which passed into law in 1917 has been in operation in restricted areas since last year. That no opposition was encountered but that on the other hand co-operation was forthcoming from the raiyats of these areas in the administration of the Act speaks, I think, for the efficiency of the remedial measures advocated and of the steps taken to bring these to the notice of the cultivators concerned.

Under C are mentioned a few measures which by improving his financial condition and thus enabling the raiyat to purchase improved implements, better feed and sufficient manure, indirectly contributes to the increase of agricultural production in the State.

(1) The proportion of area under food crops to that under non-food crops is 5: 1 for India and 5½: 1 for Mysore.

It is essential, however, that the State should be independent in the matter of food grains of which more than what will suffice for the population of the State should be normally produced. So long as cattle are used for all agricultural operations, the question of sufficient fodder for them has also to be considered. Rather than attempting to reduce the area under food crops, endeavour, therefore, should be directed towards increasing the outturn per acre so that fresh areas taken up will naturally be devoted to more remunerative commercial crops.

(2) The rise of the co-operative movement in Mysore has been of great use to the agriculturist in helping him to obtain cheap capital when he needed it. It is desirable that societies of other types such as those concerning themselves with the purchase and distribution of improved implements, better seed and manure and the sale of agricultural produce should spring up in larger numbers in the interests of the agricultural development of the country. This subject is receiving the attention of the departments of Co-operation and Agriculture.

(3) The subject of agricultural education also has received its due share of attention. There is first the large section of the rural population who are illiterate. The only way to influence them is by demonstrations of improved methods on their own fields. Talks on matters in which they are closely interested have also a certain value and gatherings at jatras, fairs, etc., have been made use of to the fullest extent. The number of such demonstrations and talks during the last five years runs well over a thousand. Short courses of a practical nature on special subjects have been held on the various farms of the Department. Then there are the boys in rural tracts. What is attempted to be given to these is not a regular agricultural course but one of nature study with an agricultural bias. This work is in the nature of an experiment still and is being done in co-operation with the Department of Education. Three schools only have been working on these lines for the last two years with a fair measure of success. The movement should be further extended before a definite opinion can be reached as to its value. The department had also something to do in training teachers for rural schools. There are lastly two special schools which give a regular agricultural course. One is the school at Chikkanhalli where the instruction is in the vernacular and the course extends over one year. Fourteen students have passed through this school. The second is the English school at Hebbal where the course is more advanced and extends to two years. Fifty-four students have passed out of the school of which twenty-four have found permanent employment in department, twenty-two are managing their own estates, eight are temporarily in Government service but will go back to the land when the appointments cease.

The publications of the department during the period under review are thirty-three in number comprising twelve bulletins, sixteen circulars and five annual calendars, besides occasional contributions on agricultural matters to the Press.

There are certain activities of the department the result of which cannot very well be estimated in terms of rupees, annas and pies; there are certain others which can to a certain extent be treated, but the figures obtained will, of course, be approximate. With this preface, it may be stated that the number of ploughs sold during the five years under reference have by improving cultivation yielded to the raiyats an increased revenue of five lakhs. The improved strains of *ragi* and the spread of the practice of green manuring will probably account for one lakhs. The planting of red mauritius cane, the application of oil cake and the adoption of better milling and boiling methods should have brought in to the cane growers of the State an additional snm of four lakhs. The spread of the practices of green manuring and single seedling transplantation has probably increased the revenue of the paddy growers by fifty thousand. The remedial operations against *Koleroga* will easily account for 1,25,000 by saving the arecanut crop in the malnad. With regard to insect pests, in one village for which definite statistical information is available the value of the crop saved from the havoc of the caterpillars may be estimated at 75,000; we are, therefore, quite safe in estimating the result of the remedial operations against insect pests in five years at 1,25,000. This estimate of 13,00,000 is increase directly due to the work of the department but it should be remembered that it takes no account of the distribution of improved seed or the spread of improved methods that we know takes place among the cultivators themselves without the direct intervention of the department. The yearly report moreover refers to work mainly with new clients and it is reasonable to suppose that people who have found it profitable to adopt the recommendations of the department will not suddenly drop the improved methods they have learnt at the end of the year but will continue them. On these considerations, I believe it will be a conservative estimate if the one already given is raised to four times the figure or about 50,00,000.

The desire to see results rapidly is very natural but if carried to the extreme is likely to seriously retard agricultural development. It has been remarked that an expensive scientific establishment is unnecessary and that we had only to strengthen our executive staff and bring to the notice of cultivators the results arrived at by agricultural departments of advanced countries. The fallacy of this view has been proved time and again in the history of almost every Agricultural Department. Every measure recommended should be thoroughly tested with special reference to the tract concerned and this can be done only by patient scientific research work. A department of Agriculture cannot afford to make any mistakes as the confidence of the raiyat when once alienated is exceedingly hard to regain. The demonstration side of the department should be developed but the scientific side should also receive full encouragement. After all, scientific research is the one thing, that on account of the large expenditure involved, private organizations concerned with the agricultural development of a country cannot undertake and that therefore devolves on the Government of that country.

The Department of Agriculture in Mysore may be considered to have passed its infancy and to be now in robust childhood. The article may be closed with a hope that necessary provision will be made for its healthy growth.

AGRICULTURE IN MADRAS, 1917-18.

By "Rusticus."

MR. Stuart's latest Report on the working of his Department is so full of interesting and important matter as to render the task of comment more than usually difficult. The best way to deal with it will perhaps be first to note what has been accomplished by the Madras Agricultural Department in increasing the outturn and quality of the crops in the Presidency in the various ways in which this can be done, whether by giving out improved strains, by promoting the use of manures or by the introduction of improved implements or improved methods of cultivation.

It is in the southern cotton-growing districts of Madras that the greatest success has been achieved in giving out improved strains. In 1917-18, there were no less than 250,000 acres under these strains which are known as Company cotton and are at least an eighth of an inch longer in staple than the indigenous cotton in addition to yielding more heavily and possessing a higher proportion of lint to seed. Mr. Stuart anticipates that the indigenous mixture will, in a very short time, have completely disappeared, as there will be ample seed of Company cotton for everyone and there will be no inducement to sow anything else, Company cotton being worth at least Rs. 20 an acre more than ordinary cotton. A profit of Rs. 20 per acre on a quarter of a million acres means that the cotton-growing raiyats in the south of Madras benefited to the extent of Rs. 50 lakhs in 1917-18, as a result of the work of the Agricultural Department. The credit for this is entirely due to Mr. H. C. Sampson, Deputy Director of Agriculture, by whose patient research work the improved strains were evolved.

In the northern cotton-growing districts, the Department has not been so successful. The two selected strains which have been given out, Hagari No. 1 and Nandyal No. 2, gave a poorer yield on the Nandyal farm last year than did the ordinary local cotton. Mr. Stuart candidly admits that they are not good enough but has the satisfaction of reporting that others have been evolved which offer much more promise. One of these, No. 14, a strain of Northerns, was considered by the Indian Cotton Committee to be one of the finest indigenous cottons they met during their tour. Unfortunately, the percentage of lint to the total outturn of seed and lint is low so that, if the new strain is to spread, the cotton trade will have to pay a premium for it which will more than make up for this. Whether it will be willing to do so remains to be seen. No. 25, the new strain intended for the Bellary district, is somewhat weak in staple which makes further trial necessary before it can be put out on a large scale. The cottons of Madras have such a good reputation for staple that it is satisfactory to know that the short staple intruder, *pulichai*, has been completely ousted from the southern districts and that, in all probability, a similar fate will befall its relative, *roseum*, which has recently made its appearance near Adoni. The Agricultural Department is confident of being able to find a strain suitable for the red soils in that tract which will combine the high yield of roseum with a staple about a quarter of an inch longer.

Substantial progress has also been accomplished with selected strains of paddy. The yield from selected seed of the local variety in Tanjore has been heavier, the ripening more even and the price obtained higher than that of the ordinary variety. Even better results are expected from the pure strains which Mr. Parnell, the Economic Botanist, has evolved. Two of these are to be tried in the Coimbatore District on a field scale whilst others under trial at Mannargudi will

be given out in the Tanjore District as soon as they have been thoroughly tested on the farm. Mr. Stuart has some interesting comments on the possibilities of the work on paddy. He points out that the value of the paddy crop in Madras is over sixty crores of rupees annually and that Mr. Parnell's work on the crop shows that this may eventually be increased by 20 per cent merely as the result of sowing pure seed of selected strains.

Of the numerous varieties of sugar-cane which were tried on the farms, J. 247 has been selected for distribution in the Godavari delta on account of its high yield and freedom from disease but it has not yet 'caught on' owing to the greater difficulty in crushiug it. The Agricultural Department has not neglected the dry grains which form such an important part of the dietary of the poorer classes in Southern India. An improved strain of *ragi* which can be given out has been evolved at Hagari but further trials are necessary before any of the selected strains of cholam (jola) can be tried on a field scale. The research work on the coconut which was commenced during the year on the West Coast deserves to be mentioned.

In these days of high prices, it is, as Mr. Stuart says, necessary to do everything possible to increase the available supplies of food grains. He holds that the best way to do this in Madras is by better manuring of paddy. Green manuring is making rapid progress and the difficulty now is not to sell seed but to obtain fresh supplies of it. There are, however, limits to the possibilities of green manuring and to obtain still better yields, the use of artificial manures is indicated. Experiments have shown that insoluble phosphatic manures such as bone meal and mineral phosphates are rapidly decomposed and used up in paddy soils in the presence of organic matter. It is fortunate that this should be the case as these manures are considerably cheaper than the soluble superphosphate which depends for its manufacture on sulphuric acid which is scarce and expensive. There is a large supply of mineral phosphate available in the form of nodules in the Trichinopoly District within a few miles of the great paddy growing tracts of the Tanjore delta. It has now been established that this form of phosphate can be readily used by the paddy plant so that the exploitation of this source of supply is a matter which should be taken up seriously and immediately. The manurial experiments with other crops were numerous but the results were not so important as in the case of paddy. A combination of castor cake and cattle manure was found to be the best manure for sugar-cane. Sulphur was tried as a manure for groundnut but the experiment was unconclusive.

The most important work done by the Agricultural Department in promoting the use of improved implements and of improved methods of cultivation was in the Tinnevelly tract, where 208 sets of drilling and inter-cultivating implements were sold against 111 sets the previous year. This is satisfactory evidence that the ryot is gradually becoming convinced of the advantages of drilling. It is uphill work, however, and the area drilled in 1917-18 was only 19,000 acres which was 4,000 acres more than in the previous year. Little could be done to push other improved implements owing to the impossibility of obtaining them even at higher prices. Seventy-seven light Monsoon iron ploughs were sold as well as a few locally made implements but heavy iron ploughs and disc ploughs were not to be got at any price and such stock as there was surrendered for use in Mesopotamia.

The primary aim and object of the Agricultural Department is to secure an improvement in the yield and quality of the various crops. The constant war which it wages against diseases and pests is an indirect method of obtaining this result. On the

entomological side, there was little progress to record during the year. The preventive measures against the stem weevil, a serious pest of Cambodia cotton, which were tried on the Coimbatore farm, did not prove very successful. This is unfortunate as the presence of the pest is now being reported from the Madura and Tinnevelly Districts. The "pollu" disease of pepper has also to be investigated. There was greater activity on the mycological side. A serious disease of paddy reported from part of the Tanjore District seems likely to be stamped out by the extremely simple method of growing varieties which are immune to it. The palmyra disease which has worked such havoc in Godavari and Kistna has, in Mr. Stuart's opinion, been reduced to the lowest terms possible with the agency available. The work of combating the *mahali* disease of arecanut trees and of preventing smut in cholam, cumbu and Italian millet is greatly hampered by the unwillingness of the ryots to incur any expenditure on it themselves. At present they only pay the cost of the chemicals used in spraying the arecanut trees and have still to be educated up to owning jointly or even to renting sprayers. The very small charge of half an anna which is the cost of the copper sulphate required to treat enough cholam seed to sow an acre was sufficient to reduce the area in the Bellary and Kurnool Districts sown with treated seed from 21,790 to 11,200 acres. We entirely agree with Mr. Stuart that, once a start has been made the policy of charging the raiyats for materials in such cases is the correct one. The Agricultural Department can only deal with a small part of an affected area. It has no guarantee that a practice has really taken root and will spread unless the raiyat buys the material of his own accord.

Sugar-cane is such a valuable crop and India's dependence on foreign exports has grown to such an extent in recent years that the spread of sugar-cane cultivation in Vizagapatam, Kurnool, South Arcot and South Canara is worthy of mention.

It is disappointing to read that both in numbers and in quality, the applications for admission to the Agricultural College were below the level of recent years. Mr. Stuart attributes this to the fact that the Intermediate Examination of the University of Madras can now be taken piecemeal and that it is easier to obtain entrance to Government service *via* the University Examination than it was formerly. This is only additional evidence that there is still little demand for agricultural education for its own sake, a matter for great regret to all who have the true interests of this country at heart. It is some consolation to know that the students actually in the College were a good lot as is shown by the results of the Examinations. All who appeared for the Diploma examination passed whilst 32 out of 34 obtained the certificate of Proficiency in Agriculture.

We are especially glad to see that, during the year, much was accomplished in securing closer connexion between the Agricultural and Co-operative Departments. In the past, one department has often exploited a tract which the other could not take up for want of staff or other reasons. In future, both Departments will make special efforts to concentrate on the same tracts. The Co-operative Department will also pay special attention to the provision of cheap credit for the class of non-occupancy sub-tenants who are the real cultivators of the soil in so many parts of Madras and whose poverty is so great an obstacle to the progress of agricultural improvement. Mr. Stuart adds that, as a result of the conference between the two Departments, some progress was made during the year and considerable experience was gained. The adjectives he uses have evidently been carefully chosen for, judging from the details he gives, the experience was

much greater than the progress. Some Co-operative Credit Societies commenced the joint sale and purchase of agricultural produce and requirements. The District Agricultural Associations all over the Presidency, which might be a useful link between the Agricultural and Co-operative Departments, seem to be either dead or dying.

In conclusion, mention must be made of the excellent work done by the Agricultural Department at the Madras Exhibition of 1917. All sections did well but the gold medal was borne off by the Agricultural Chemist and his subordinates whose exhibits showed that patent breakfast foods, invalid foods, molted milk foods, photographic printing art paper, washable paint and boot polishes to mention a few examples, could be prepared from materials available in India. Whether they can be made at a profit is another matter, but to quote Mr. Stuart once again, the first step is to demonstrate that they can be made. In these days, all sorts of new industrial enterprise are being feverishly promoted in Calcutta and Bombay, capitalists with judgment and enterprise might do worse than turn their attention to the possibilities foreshadowed by the work of the Madras Agricultural Department.

The Report of the (British) Inquiry Committee on Paper Supplies recommends that paper manufacture be regarded as a key industry. Without necessary supplies of paper, no Government can hope to carry on immense propaganda campaigns which were so successful during the recent war.

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A Sugar Commission to explore the possibilities of the sugar industry will shortly tour in India. Mr. McKenna will be the chairman. Three members will be appointed from England. The Hon. Mr. Lalubhai Samaldas, C.I.E., has accepted a seat on the Commission. The Commission's enquiry is expected to last some eight or nine months.

INDUSTRIAL CO-OPERATIVE SOCIETIES.*

By Md. Mahmud,

Joint Registrar of Industrial Co-operative Societies, Bengal.

THE Industrial Branch of this Department has been started with the idea of helping the artisans and craftsmen of Bengal to improve their lot and to increase the country wealth by means of co-operation. Before entering into a discussion of matters co-operative let us first consider what are the principal cottage industries of Bengal and which of them deserve special attention in this connection. In this paper I propose to deal only with the "useful" industries and shall leave out of account the artistic industries like ivory-carving, *bidri*-work gold and silver wares and the gold and silver and *chikon* embroideries.

It is well-known that the principal cottage industry of this Presidency is weaving. Among the vast population engaged in this industry the most numerous are the cotton weavers, next to them come the silk weavers and then the wollen blanket and carpet weavers. The weavers are divisible into two broad classes, *viz.*, the highly skilled weavers of specialised cloths and the common weavers who weave cloths principally because it is their caste profession and their only means of livelihood. Under the former class might be mentioned the *matka* weavers of Malda, the *matka* and *garad* and flowered silk weavers of Murshidabad, the tussar weavers of Birbhum and Bisnupur, the muslin, jamdani and kashida weavers of Dacca and the fine *sari* weavers of Bajitpur in Mymensingh and Santipur in Nadia. Under the

* A paper contributed to the Tenth Provincial Conference of the Co-operative Societies in Bengal. With acknowledgments to the Official Report.

later category come the Tantis and Jolahs, scattered all over the province, who weave coarse *dhotis*, *saris*, *chadars* and *gamchas*.

Allied to the silk weaving industry are silk-worm rearing and silk reeling which are carried on to a large extent in the districts of Malda and Rajshahi. Silk reeling is so far behind silk-worm rearing that hundreds of maunds of cocoons are exported annually from the above districts to Murshidabad, Benares and other places. And, owing to the decadence of the weaving industry large quantities of reeled silk have to be exported to foreign countries. It need hardly be pointed out that there is therefore considerable room for improvement in the silk reeling and silk weaving industries.

Next in importance are the brass aud bell-metal industries the principal seats of which are Bishnupur in Bankura, Nalhati in Birbhum, Kharar and Ghatal in Midnapore, Khagra in Murshidabad, Bansberia in *Hooghly, Ranaghat in Nadia, Malda town,* Natore, Dhamrai in Dacca and Kagmari and Islampur in Mymensingh. The most important products under this head are household utensils. Brass padlocks are produced by cottage workers in some places round about Calcutta, and the activities of the Indian Munitions Board during the recent world-war have demonstrated that Indian cottage brass-smiths can manufacture brass buttons, hooks, loops, slides, etc.

The weavers and the brass and bell-metal workers work under a system according to which most of the profits go to the middleman and the actual producer gets bare living wages. The *mahajan* or the *bepari* supplies the weaver or the brass-smith with the raw material and afterwards takes away the finished product from him paying him wages at the lowest rate possible. In fairness to the *mahajan* it must be admitted that this system is not without some advantages. It saves the weaver or brass-smith the trouble of obtaining raw material and selling his product, and the *mahajan* often helps the man by paying in wages in advance or giving him loans in times of stress. But the fact remains that major portion of the fruits of the man's labour goes to the *mahajan*, and the producer is left in poverty and ignorance, as indeed the *mahajan* wishes him to remain.

The metal industry is somewhat more complicated than weaving, for in all the large centres it is worked under a semi-factory system, so that there are two grades of middlemen between the producer and the market. The middlemen of the first grade, who his generally a big trader in Calcutta, lays out the order with the middleman of the second grade, who is often of the more prosperous brass-smiths in the village. The latter brings together some poor brass-smiths and gets the article turned out by them in his workshop. He pays them the bare wages and supplies the articles to the Calcutta man at the highest rates he can get him to pay.

Mention must next be made of the chank-*shell and horn manufactures of Dacca.* From very early times there are settled in the town of Dacca a colony of men known as *shankharis* whose sole profession consists in making bangles, ring and other trinkets from chank-shells. The shells are imported from Tuticorin in the Madras Presidency and from Ceylon, and the manufactured articles are used by Hindu women of all classes in Bengal. There are other classes of persons in and round about Dacca and in a place in the Brahmanbaria Sub-division of the Tippera district, who manufacture large quantities of buttons from mother-of-pearl. This industry is of recent growth, some say it originated with the *swadeshi* movement. The pearl-oysters are fished from the inland streams in Eastern Bengal by a class of men known as *badias*, principally for pearls. The oysters are opened by them, the pearls, if any, taken out and the shell pieces left in heaps on the banks. These heaps are purchased at nominal prices by another class of persons known as *chunaris* who burn them in small kilns and make lime for human

consumption with betel-leaves. Since the introduction of button-making, the shells fished in the neighbourhood of Dacca and Narayanganj are purchased by the button-makers and are converted into buttons which find ready sale in Dacca and Calcutta. There is great scope for expansion of this very useful industry. In view of the fact that enormous quantities of rock lime are available in the neighbouring district of Sylhet, East Bengal has no necessity for using shell lime. All the pearl oysters fished by the *badias* can be available for the button-makers, and Bengal can, with a little organization, be in a position not only to supply her own needs in the matter of buttons but to export some to other provinces.

The manufacture of combs from horns used to be carried on at Dacca from time immemorial. Recently they have begun to make buttons from horns, and a great impetus has been given to this new industry by the large orders laid out by the Munitions Board. The Colonisation Officer of Bakarganj tells me that if the horns lying in the buffalo-grazing areas in the Sunderbans were collected there would be sufficient material for thousands of gross of buttons. And I know of similar areas in the islands of Dakshin Shahbazpur, Hatiya and Sandip where very large quantities of horns are lying and rotting to waste.

Another industry which should have been mentioned with weaving but which has an importance all its own, is carried on in many villages in the districts of Tippera, Dacca, Bakarganj and Pabna by a class of men known as *Kapalis*. These people twist jute twine by hand and weave gunny cloth with it in a very crude and laborious process. Their products are better than mill-made gunnies, but the price does not in all places compare favourably with that charged by the mills. Some improvements have already been made in this industry in the sub-division of Brahmanbaria and efforts are being made to introduce a simple machine for twisting the thread and the fly-shuttle loom for weaving the gunny. Having regard to the fact that almost every cultivator in East Bengal produces jute one can easily imagine what great potentiality there is in this industry. There is not likely to be any caste prejudice against it, and, in the words of Babu Naba Gauranga Basack, the late Sub-divisional Officer of Brahmanbaria, every cultivator can work at it in his slack season and make his maund of jute pay Rs. 30 instead of Rs. 10.

The districts of Noakhali, Dacca, Faridpur and Jessore are very rich in date palm, and large quantities of sugar-cane are produced in the districts of Bakarganj, Pabna and Birbhum. For want of knowledge and means the cultivators cannot provide themselves with cane-crushing and sugar refining plants. It is conceivable that with proper organization the cultivators of Bengal could produce considerable quantities of sugar and thus enrich themselves and the country.

Similarly, with organization and co-operation, the *Kolus* (professional oil-pressers) in the oil seed producing areas might be able to make much more money then they do now and the country could get a more plentiful supply of pure oil for consumption.

Another important industry consists in the manufacture of bags and baskets from cane and of mats from reeds and grasses. The texture of the old-fashioned cane *petaries* of of Sherpur and Char Iswardi in the Mymensingh district is an object of wonder to many and is fit to win prizes in any Exhibition; and the cane-boxes, trays and luncheon baskets made for the Bengal Home Industries Association by the basket-makers of Brahmanbaria bear eloquent testimony to their skill. The mats manufactured at Sabong in the Midnapore district are too well-known in Calcutta to need any introduction, and the *sitalpatis* made in the Mymensingh and Pabna districts, though not so fine as those of Sylhet, are very useful and are extensively used by the common

people. There is, therefore, no reason why the people of Bengal should not satisfy their needs for this class of furniture with country-made goods in preference to those of Chinese or Japanese manufacture.

Bengal had her own cottage gun-smith at Bonpas Kamarpara in Burdwan district, and there were makers of cutlery in several places in the province. Remnants of the latter are to be found at Kanchannagar in Burdwan, Brahmanbaria in Tippera, Duttapura in Noakhali and Uzirpur in Bakarganj. In and round about Calcutta there are blacksmiths who make nuts, bolts, rivets, etc., in pursuance of orders laid with them by certain firms of Engineers and Contractors. While I am doubtful whether our cottage blacksmiths can compete with the power-driven iron-works, I must at the same time say that they have a chance of improving their condition if they specialise in some things, *e.g.*, tea-pruning knives, pen-knives and small agricultural implements.

There are in Bengal an indigenous class known as *Rishis* and a class of settlers known as *Muchis* whose profession it is to tan leather with bark and to make shoes for sale. Some of them have now taken to buying tanned leather for making shoes. Owing to the competition of the mill-made shoes the number of these shoemakers is dwindling gradually. But anyone looking at the prosperity of the Chinamen working in Bentinck Street cannot but feel that there is every chance of our succeeding in bettering the condition of the *Muchis and Rishis.*

Another industry which is of great national importance is that of milk supply, for on it depends the physical well being of future generations. The question of milk supply is much more acute in the case of towns and cities than in that of villages, and it is in the neighbourhood of the larger towns that the milk industry can be carried on on an organized basis. It is calculated that on an average about 250 maunds of milk is brought into the Calcutta market every day from villages in the Baraset Sub-division. By organizing a few co-operative societies in that area this Department has already succeeded in providing a daily supply of nine maunds of milk to Calcutta. I need hardly add that given the necessary staff and facilities, we can do much more. In the town of Dacca something was tried in this direction through co-operative societies.

Anyone acquainted with Bengal knows that the province is very rich in fisheries and that a vast population of *Jhalos, Malos, Nikaris* and others live by catching and trading in fish. According to Mr. Southwell there is much scope for improvement in this industry.

Among minor industries may be mentioned paper-making, which is carried on to a small extent in cottages in the districts of Howrah, Hooghly, Murshidabad, Pabna and Dacca, and pottery and toy-making, which are carried on in the districts of Birbhum, Nadia, Tippera and Dacca. A gentleman of Brahmanbaria has invented a small machine for manufacturing safety matches, but it is still in the experimental stage.

It is a patent fact that our cottage workers, as a class, are wholly illiterate and owing to the gradually decadent state of their industries they have lost the enthusiasm for learning good work and becoming efficient craftsmen. So, if we mean to revive our cottage industries the first thing to do is to rouse their ambition and to widen their outlook in life. The next is to indicate the means by which they can improve their condition. The leaders of thought in this country, both official and non-official, have come to the conclusion that co-operation is one of the means by which the artisans can work out their salvation. By banding themselves together in co-operative societies, that is to say, by pooling their resources and offering joint liability, they can improve their credit; and by combining for purposes of production and sale they can buy raw

materials on advantageous terms and sell the finished products at much greater profits. Through co-operation they will be able to adopt improved methods of production. The majority of our weavers work with old throw shuttle looms. One of the first things a co-operative weavers' society can do is to rise a loan and provide each member with a fly-shuttle loom, thus increasing production by at least 30 per cent. The blanket weaver can double the value of this product by weaving the blanket in one piece in a fly-shuttle loom instead of in four pieces as at present. And the shoemaker can improve and increase his output by providing himself with small hand sewing machines like the Chinaman's. The brass-smiths can erect co-operative worksheds and accelerate production by working with power-driven lathes.

The chief difficulty with most Industrial Co-operative Societies is the fact that their members cannot offer landed security, and the Central Banks which are the chief financing agencies, naturally hesitate to give them loans. Fortunately, however, the men at the helm of affairs in the Central Banks are educated men who are realising more and more everyday that to bring about the industrial regeneration of the country some risks must be taken. Another difficulty is the illiteracy prevailing among the industrial classes and the paucity of men who can write the books and accounts of the societies. This necessitates much closer supervision in this case than in the case of ordinary credit societies. One other difficulty we have to face is the opposition of the *mahajans* and *beparis* who have up to now been deriving large profits by acting as middlemen. They naturally view the co-operative movement among the villagers with disfavour. They are always ready to circulate all sorts of wild rumours and to impute sinister motives to those who try to organize societies. They refuse to take over the co-operative craftsman's products for sale, and as most of the craftsman owe them money they often threaten them with suits for immediate recovery of the loans.

In paragraph 266 of their report the Indian Industries Commission have expressed the opinion that "before any such (agricultural or industrial) movement can be organized the ground must be usually prepared by the educative influence of co-operative credit, the simplest and most readily accepted form of co-operation in this country." In Bengal industrial societies were first started on the above principle, but it having been found that in many cases the loans taken by weavers for purchasing raw materials were often squandered away, cash advances to individual weavers have had to be stopped; the society now takes loans from the Central Bank, purchases yarn and distributes it among the members. It must, however, be recognised that there are bound to be two classes of industrial societies, *viz.*, industrial co-operative production and sale societies and industrial co-operative credit societies. I will make myself clearer. Suppose a number of prosperous weavers in Santipur decide to form a society and purchase yarn from a mill or a merchant at Calcutta and export their woven cloths to Calcutta merchants without reference to any middleman. The funds for the business of this society are raised by subscriptions or deposits from the members and the work is conducted without outside financial assistance. Now, take the case of a society formed amongst silkworm rearers in the district of Rajshahi. These men require money for buying mulberry leaves for feeding the worms and unless the money is forthcoming they cannot get along. And experience has shown that societies amongst fishermen are mere credit societies, because it is impossible to get the fishermen to keep accounts of their catches and sales.

At present there are the following industrial societies at work:—

Industrial Union	... ...	1
Weaving Cotton	... ...	78
„ Silk	... ...	2

Weaving Blanket	1
Silk reeling	1
Silk-worm rearing	1
Milk supplying	9
Fishery	24
Shoe-making	4
Toy-making	1
Oil pressing	1
Irrigation	1

Most of these have been organized by the officers of this department with the help of local gentlemen. But it will be readily seen that we have not yet touched even the fringe of our industrial field. The departmental staff is limited and their more important duty is the supervision and guidance of the existing societies. So unless non-officials co-operate with us in large numbers and devote some time and attention to the organization of Co-operative Societies amongst the artisans and craftsmen our progress must needs be very slow. Though the movement is for his benefit, the industrial worker as a class is so conservative and distrustful that he takes a lot of persuasion to join a Co-operative Society. It is only by constantly dinning the principles and benefits of co-operation into his ears that he is to be made to do so. Herein lies a great field for activity for patriotic Indians. For any one having the welfare and progress of his country at heart cannot but see that industrial co-operation is bound to be directly beneficial to the country. It is real social service and service of the motherland.

In this country there are two schools of thought in the matter of industrial progress,—one holding that we should neglect our home industries and take at once to the factory system, the other maintaining that our artisans and craftsmen should continue to work in their cottages as before and should not be dragged into the smoke laden and morally unhealthy atmosphere of the large cities and factory towns. The former are apt to forget the old saying that Rome was not built in a day, and the latter lose count of the fact that in this age of race for progress there can be no such thing as remaining stationary,—he who halts must be left behind. The more rational solution seems to be for the country to advance by steps from the individual cottage worker to the co-operative combination or small co-operative factory and then to beg in industrial enterprises. This would, in the words of Sir Daniel Hamilton, be building from the village upwards. A striking example of what co-operation can do is afforded by the Naogaon Ganja Cultivators Co-operative Society; and I see no reason why we in Bengal should not think of starting co-operative jute mills, rice mills, oil mills and sugar factory.

The best way to proceed would be to divide the province into industrial blocks and to found an industrial Central Bank or Union in each of them. These bodies should make it their business to organize industrial societies, to finance and supervise them (of course, in collaboration with the departmental staff) and to help them in procuring raw materials and disposing of their finished products. One such Union already exists in Bankura and another is on the anvil at Dacca. The need for such an institution is being increasingly felt with increase in the number of weavers' societies. Such societies have to be very carefully nursed in the beginning, and when they begin to make some progress it becomes necessary for some intelligent body to help them in getting yarn and selling their cloth. It has already been said that the *mahajan* deserts the member of a Co-operative Society, and the members are so illiterate that they cannot write to a mill or merchant for yarn, nor do they know where the article can be had. It, therefore, devolves on the Union to correspond on their behalf and to get them the yarn. Then, when the cloths are woven, the *bepari* will not take them over for sale, and the members are so poor that if the cloth does not

sell quickly they will have to starve. It, therefore, becomes necessary for the Union to either find a market somewhere and send the cloth there or to take the cloth over and stock it for future sale and then advance further money or yarn to the society for its work. In short, we cannot secure the profits to the workman unless the middleman is eliminated, and unless we can found Unions which will undertake the work that the *bepari* used to do and take the risks that the *bepari* used to take the co-operative societies cannot make headway. The Indian Industrial Commission have expressed themselves on this point in the following terms :—"The problem is to find an outlet for his (weaver's) increased production, and efforts to improve the lot of the handloom weaver must end in failure, unless attention is concentrated to a much larger extent than has hitherto been usual on commercial questions, which involve the purchase of raw materials, the selection of suitable designs and patterns and the establishment of commercial agencies for disposal of goods" (paragraph 144 of Report.) To keep the Unions well posted with commercial information and to help them in disposing of their stocks it is necessary that there should be a central institution in Calcutta. It may either be a branch of the Co-operative Federation or be a provincial co-operative Industrial Union. Such a body will be in a position to take expert advice in matters of designs and sources of supply and sale from the Director of Industries and the Department of Commerce and to pass on the advice and information to the mofussil Unions. It could maintain a parallel list showing the places where certain articles are produced and the places where they are consumed. The information furnished by such a list would be of immense advantage to the societies, for they could then enter into direct correspondence with consumers and could send their products to them. There might even be exchange of articles between two co-operative societies in two places. I will illustrate this by a recent incident. The Bankura Industrial Union had in stock a few hundred pairs of *dhoties* woven by the members of co-operative societies under it. The Registrar of Co-operative Societies showed samples of them to the members of the Bakarganj-Sunderbans Co-operative Supply and Agricultural Sale Society. The latter society has ordered 100 pairs of those *dhoties*. It will probably pay in cash this time. But in view of the partial failure of crops in Bankura this year it is very likely that the weavers of Bankura will import rice, and it is quite possible that they will take it from one of the consignments that the Sunderbans Society sends to Calcutta at intervals of four or five weeks.

A Central body of the proposed type could keep a stock of yarns, metals and other raw materials and issue them to the mofussil societies at the lowest possible prices. We have heard of a Central Weaving Supply Institute at Benares which apparently works on such lines and receives either subsidies or loans from the Board of Industries of the United Provinces. (I must confess that I have not yet been able to gather accurate information about the above institute). And lastly, such a society could take over the surplus produce of the mofussil societies and sell them in opportune moments and in the best markets.

Owing to the competition of the mill-made goods and to frequent fluctuations in the market the district Unions and the provincial Union may at times incur some losses in selling their stocks of co-operative products, but such risks are worth taking. The Indian Industrial Commission have said, "In view of the importance of improving the position of the cottage worker, where he is handicapped, as at present, by the want of a free sale for his goods, it is justifiable to incur some risks in experimental efforts" (paragraph 268 of Report). Government could help the co-operators in this matter by

furnishing guarantees or rendering financial assistance.

To bring about increased production three things are necessary :—

(*i*) to increase the efficiency of the artisan by general and technical education;

(*ii*) to introduce improved tools and time and labour saving appliances; and

(*iii*) to supply raw materials, to introduce new designs and to find wider markets.

On point (*i*) above, the Government and the public have before them the valuable suggestions of the Hon'ble Mr. J. G. Cumming, Mr. Gupta and the *Indian Industrial* Commission. Some hints on point (*ii*) have been given in paragraph 15 of this note, and some aspects of point (*iii*) have been discussed in the foregoing paragraphs.

To accelerate the sale of our cottage products the desiderata are Government patronage and public patriotism. A happy combination of these two is to be found in the Bengal Home Industries Association which has already achieved so much success. In a speech delivered in the Bengal Council on the 26th July 1915, the Hon'ble Mr. (now Sir Nicholas) Beatson-Bell said "One of the chief advantages of these societies (co-operative societies of weavers and other workers) will be that they will facilitate the working of the Government patronage of Indian Industries." The Indian Industrial Commission have recommended that Government should purchase stores as much as possible in India. We may, therefore, safely assume that Government patronage will be extended in all deserving cases.

But what is still more wanted is that the people should buy and use the products of their own country. Charity begins at home, they say. We must even be prepared to make some sacrifices in order to give an impetus to our home industries. If, with such noble objects in view, we discard many of the foreign luxuries and satisfy our needs with country goods we shall, in the words of late Lord Minto, be practising real 'honest *swadeshi*' to which no one can take exception.

It is a maxim of political economy that supply is induced by demand. But the activities of Germany and Japan in recent times have established it as almost a truism in the commercial world that demand is often created by supply. We have to bring about a modification in the tastes of the present generation and make them patronise our home products by taking the articles to their doors and offering them for sale. The most effective way of doing this is to have a large number of co-operative stores dotted all over the country and to get them to deal in all countrymade goods and in the products of co-operative societies in particular. One of the quickest ways would be to offer our wares for sale in the co-operative stores that have been started in some colleges in Calcutta and in the mofussil. We should thus be rousing the patriotic and practical instincts of our future citizens, the young men in the University.

The District Unions and the Central Union should have industrial co-operative museums attached to them. They should advertise their products widely and should send goods to the exhibitions held annually in the several parts of this province as well. Until a Central Union is started at Calcutta its functions should be discharged by the Industrial Branch of the Co-operative Department. The Departments should be provided with funds for the work of development, advertisement and exhibition.

THE INDIAN EXCHANGE PROBLEM.

BY PROF. K. T. SHAH, B.A., B.Sc.

When the last Royal Commission on Indian Currency and Finance wrote:

"Our view is that India neither demands nor requires gold coins to any considerable extent for purposes of circulation (as opposed to saving or hoarding), that the *most generally suitable media* of internal circulation in India are at present *rupees and notes*, and that the Government should, as opportunity may offer, encourage notes, while providing,—*and this the cardinal feature of the whole system*,—absolute security for the convertibility into sterling of so much of the internal currency as may at any moment be required for the settlement of India's external obligations." (Para 76).

none of the members of that body envisaged or contemplated a situation at all similar to the one that has developed as the result of the influences at work during the War period. For sixteen years after the value of the rupee had been fixed at an arbitrary figure, 1*s*-4*d*, it was so maintained; and facilities were offered for the conversion of the rupee for purposes of settling India's international obligations or dues within points ascertained to represent the cost of transport of bullion to and from India. In the first days of the War the situation was so far similar to that contemplated by the Chamberlain Commission that the Government, acting in the spirit of the Commission's recommendations, had to afford a guarantee for the maintenance of the exchange value of the rupee in terms of the international medium of payment: Gold. For the first few months of the War the guarantee was practically utilised, and Reverse Councils to the total amount of £8·7 million were sold in India to be paid in England out of the Gold Standard Reserve. From and after the commencement of the Financial year 1915-16, the situation began to alter perceptibly. The large outlay of the Government of India on behalf of the British Government, increasing every year in amount, more than balanced the obligations of the Government of India payable in England as Home Charges. The invisible Imports of India averaging £20 million a year, were thus met by the recoveries of the Secretary of State from the British Exchequer, and one greater factor in influencing Indian Exchange was temporarily reversed. On the other hand, as the War continued trade began to be adjusted to the new conditions; the exports of Indian produce began to increase in value if not in quantity, thanks to the urgent War demands of the Allies; and, on account of diversion of freight for military transport purposes, and later on on account of its absolute scarcity combined with the change in English industrial organization for the production of munitions, the imports of foreign produce into India began to diminish. A large balance thus arose in favour of India, which was all the more significant because the old converse stream of payments from India in the shape of Home Charges had dwindled into nothing. The prevalence of high Income and Property taxes in the United Kingdom, had moreover, induced the English merchants and capitalists in India to postpone the remittance of their profits to England, and to re-invest them in Industrial or other securities in India itself.

The mechanism of Exchange was thrown out of gear. The Councils, originally used to meet the Home Charges, were, according to the recommendations of the Chamberlain Commission to be used to liquidate the trade balance if the resources of the Government permitted*. They were now used (since the

*"It may be said that it was necessary for Government to supply up to the limit of their power the demand of trade for funds in India. We have already said that we do not favour the view thus implied. The interests of trade are, indeed, of high importance, but it is not the business of Government to favour trade at the expense of general revenues." (Report.)

Financial year 1915-16) almost wholly for purposes of trade balance. In the first year of the period (1915-16) Government maintained at the fixed rate of exchange an unlimited sale of Councils sufficient in fact to meet and liquidate the entire balance in favour of India. But the strain began to grow as each week a larger amount was demanded. The encashment of the Council Bills at the Treasuries of the Government in India, or at the Presidency Banks was to be made in rupees or Notes, which could only come from reducing the Government balances, or increasing the invested portion of the Paper Currency Reserve and thereby freeing an equal amount of rupees for circulation. Put briefly the financial position of the Government of India in 1915-16 was thus: The estimated outlay on account of the British Government was £18'6 million or nearly 28 crores of rupees. Councils were sold in that year for Rs. 30'36 crores. Against these the Home Charges totalled Rs. 30 crores; the Fiduciary Reserve against the Paper Currency was increased by 12½ crores for investment in England; and Rs. 11¼ crores were obtained from the Gold Standard Reserve. The balance was made up by new coinage and by reduction of Government balances. In the next year the recoverable expenditure amounted to £38'5 million, against which were to be set off Rs. 32 crores in respect of the Home Charges. Councils were sold to the tune of 49 crores thus creating a total rupee need of 75 crores in round figures. This was met by the Revenue surplus, (including loans raised) of 49 crores, and new coinage of nearly 31 crores. The invested portion of the Paper Currency Reserve was also increased by another 28½ crores. The excess was used to purchase silver and make further investments in the British War securities on behalf of the Gold Standard Reserve. The position for 1917-18 and 1918-19 is represented by the subjoined table:—

Position in 1917-18.

(The figures are taken from the Financial Statements.)

Recoverable expenditure ...	£. m.	65'0
Council Bills	,,	35'3
Special Recoveries	,,	2'1
Increased receipts from Foreign Money orders	,,	5'3
Subscription to Indian War Loan in England	,,	1'1
Total ...	,,	108'8

Ordinary Home Charges including Capital expenditure	£. m.	25'0
Silver purchase	,,	13'5
Payments to British Treasury ... (India's War contribution)	,,	35'1
Investment in English Treasury Bills. (Paper currency reserve)	,,	8'7
Investment in Coinage profits (Gold Standard Reserve)	,,	1'4
Special investment in English Treasury Bills	,,	20'0
Discharge of Indian Debt ...	,,	2'1
Miscellaneous	,,	0'4
Total ...	,,	106'2

Position in 1918-19.

Recoverable expenditure ...	£. m.	76'0
P. O. and M. O. Charges ...	,,	4'2
Excess of Treasury Bill payments over *receipts*	,,	10'7
Re-payment of temporary loan from Bank of Bombay ...	,,	2'7
Council Bills	,,	20'6
Cost of Military stores	,,	12'7
Rupee credit for Fideral Reserve Board (U. S. A.)	,,	11'0
Gold remittances	,,	2'0
Additional takkavi loans ...	,,	1'4
Total ...	,,	141'3

War loan receipts	£. m.	37'1
Receipt of purchased silver ...	,,	56'3
Revenue surplus	,,	13'0
P. C. R. investment	,,	24'7
Reverse Councils	,,	4'8
Reduction of balance	,,	5'4
Total ...	,,	141'3

This was the position of the Government of India. The same transactions were a little different as far as the Secretary of State was concerned, and are represented by the subjoined table:—

Transactions of the India office in 1918-19.

Councils receipts	£. m.	20·9
Recoveries from H. H.'s Treasury ...	,,	86·3
Special recoveries	,,	13·1
P. O. and M. O. receipts ...	,,	4·3
Reduction of balances	,,	3·1
Total ...	,,	131·3
Ordinary Home Charges ...	£. m.	22·9
Silver payments	,,	44·0
Second Indian War Loan ...	,,	33·4
British Treasury Bills (investment) ...	,,	20·7
Sterling transfers	,,	5·4
Discharge of Indian debt ...	,,	1·8
Miscellaneous	,,	3·1
Total ...	,,	131·3

WAR AND THE MECHANISM OF THE INDIAN CURRENCY SYSTEM.

Thus, then, the Government of India had, *during the greater part of the* War period, to face an entirely new situation. In spite of heavy, almost lavish investments in the English War securities by the Government of India, the balance in favour of India could not all be destroyed. The gold, which, in years immediately preceding the War, was becoming more and more acceptable to India for settling the trade balance due to her, was, under war conditions, impossible to obtain, belligerents and neutrals guarding and adding to their gold Reserves with an uncanny jealousy. The only alternatives open to the Government of India were: to coin new rupees, to add to the note circulation, and, when both these were used to the utmost limits of prudence or good faith, to raise the exchange value of the rupee. Between April, 1915, and the end of the last financial year, 1918-19, according to the Finance Minister, nearly 120 crores of new rupees were put into circulation. The note circulation, which was, about Rs. 68 crores on 31st March, 1914, was according to the latest figures available, over 166 crores. The rate of Exchange was raised, first in the beginning of 1917 to 1/5*d*, to 1/6*d* in April 1918, to 1/8*d* in May, 1919, and at last to 1/10 on the 11th August, 1919. There are apprehensions in well-informed circles that, in view of the rise in the price of silver, and considering that the latest rise was made even before the Currency Committee had presented its report, Exchange might even be put up to 2s. in the near future.

In spite of the concurrent application of all these remedies the situation has by no means improved. The Committee recently appointed to consider the whole question and to advise upon it, indicates the gravity of the situation, at the same time that it affords an opportunity fundamentally to reconsider the entire Currency organization of India. The subjoined table gives in a concise form all the important factors of the situation as they prevailed in the War years; and, judging from recent events, it does not seem that they have altered in any appreciable degree as yet:—

(The figures are in crores of rupees except in the last two columns.)

Year	Exports	Imports	Excess	Councils	H. Charges	Gold Import	Silver Import	Rec. Ex.	Rs. coined
1909-10 ...	187'96	122'65	65'31	40'54	29'68	21'67	9'44	In million sterling.	217,56,166
10-11 ...	209'96	133'70	76'25	40'02	29'37	23'98	8'63		219,25,112
11-12 ...	227'99	144'45	83'93	40'83	28'93	37'76	5'33		2,80,74,320
12-13 ...	246'21	166'63	79'58	38'50	30'42	34'00	17'20		19,53,69,944
13-14 ...	249'00	191'30	57'70	46'59	30'46	23'32	13'03		13,15,68,537
14-15 ...	182'17	144'93	37'24	11'68	30'31	7'64	8'87		2,17,95,336
15-16 ...	199'48	138'17	61'31	30'36	30'16	—1'10	4'83	18'6	1,62,02,109
16-17 ...	243'04	160'23	82'81	49'04	31'72	13'23	18'80	38'5	30,77,07,327
17-18 ...	244'89	164'35	80'53	51'28	39'10	25'17	19'04	65'00	23,15,69,657
*18-19 ...	255'27	188'56	66'71	31'35	...	...	...	76'0	...

* [These figures are from the April issue of the *Capital*; the others from the statistics of the Government of India.]

By a comparison of these figures it will be seen that :—

(*a*) While in the quinquennial before the War the net excess of exports of merchandise on private account amounted to Rs. 362,79 crores, during the War quinquennial the excess on the same account was Rs. 328,62 crores; If we include the transactions of the Government the net excess in the former period was 391 crores, and in the latter 381 crores.

(*b*) The net imports of Gold on private account during the first period was Rs. 144 crores and of silver Rs. 36 crores or a total import of precious metals of Rs. 180 crores. Against these in the following five years the total imports of precious metals were Rs. 55 crores. The gold imports almost entirely fell off, the total for the period being Rs. 39 crores, of which 18 crores were acquired by the Government, leaving only 21 crores for private absorption. Hence the demand for silver, hence the heavy purchase of silver by the Government of India, the rise in the price of the silver, and, finally, the rise in the rate of Exchange.

(c) The recoverable expenditure of over £200 more than set off the Home Charges amounting to about £100 million and facilitated considerable investments in British securities.

III. The Remedies so far tried by the Government of India.

We have deliberately left out in this brief review of measures adopted by the Government of India those restrictions on trade finance which were tolerated only on the excuse of the supreme necessity of finishing the fight successfully. They were, besides, in their nature nothing but palliatives which may lull the patient to sleep, but cannot cure him of his malady. Thus War-time

restrictions on financial facilities to exporters from India by requiring the Banks to curtail their accommodation except to those dealing under Government license or those able to provide full cover, would, in normal times, have been resented by the Bankers, who could have easily rendered such restrictions ridiculous. And even in War-time the Banks were bound by no law to respect these wishes of the Executive, except for fear that on default they might be cut off from such share of the Council Bills as would otherwise fall to the lot of complacent banks. But though the banks did, to some extent, carry out this policy of restricted finance, it is doubtful if it was really helpful in reducing the strain. Similarly, prohibition of certain classes of exports, though restricting trade in those articles, did not affect the excess in value of the exports over the imports, and consequently can scarcely be described as a successful expedient in saving the Exchange situation. The only remedy of this description, which may at all be said to have been successful, was the Gold Import Acts. The forcible acquisition by the Government of all imports of treasure on private account, coupled, later on, with restrictions on the export of rupees or silver bullion from India, deserved a better fate, and might have been more successful if it had been applied earlier. The object of these measures was to prevent speculative purchases of the precious metals; and, by centralising their supply in the hands of the Government to provide an abundant supply as far as the demand was a genuine trade demand. Unfortunately the measures were adopted at a time when the crisis had already become tensely acute. The influence of the speculative element was by no means confined to the India market. The world at large had agreed to a tacit conspiracy to withhold gold from India. The Government of India were known to be considerable purchaser of silver. There was, therefore, no reason why the shrewd Yankee should not make a profit as much from his silver resources, as from the other supplies he offered to the belligerents. It is quite true that the Government of the U. S. A. since 1917 offered to co-operate with the Government of India in keeping the price of silver within bounds; but those bounds came to be fixed at a time when the price of silver had already broken its records for the last thirty years or more. Consequently, in fixing the price the two Governments had necessarily to consider existing conditions, and not the conditions which obtained before the War. The American restrictions on the price of silver, moreover, were imposed only for the duration of the War; and, so soon as the War was definitely over those restrictions were removed, with the result that we in India are suffering from a most acute silver shortage in the first year of peace. Our two last rises in Exchange have taken place too closely on the heels of the removal of American restrictions not to raise a reasonable suspicion that the market had been kept in check by the co-operation of the American and Indian Governments, and that the moment that co-operation was withdrawn the actual situation had asserted itself

Taking seriatim the three principal remedies of the Government of India coining more rupees, adding to the note circulation, and raising Exchange,—the first had definite limits put to it not only by the scarcity of supply and the consequent rise in price of the material, but also by the undesirability of adding too mnch to the circulation. In his interesting Report on the rise in Prices in India, Mr. Datta gives the following table showing the growth in the circulating medium and its effect on prices.

Growth in Currency notes and Rupees in active circulation.

			Circulation crores	Index. No.
1884	...	...	115	88
1885	...	...	118	90
1886	...	...	117	90
1887	...	...	116	89
1888	...	...	118	90
1889	...	...	123	94
1890	...	...	120	92
1891	...	...	131	100
1892	...	...	141	108
1893	...	...	132	101
1894	...	...	129	99
1895	...	...	132	101
1896	...	...	127	97
1897	...	...	125	96
1898	...	...	122	93
1899	...	...	131	100
1900	...	...	134	103
1901	...	...	150	115
1902	...	...	143	109
1903	...	...	147	113
1904	...	...	152	116
1905	...	...	164	126
1906	...	...	185	142
1907	...	...	190	145
1908	...	...	181	139
1909	...	...	198	152
1910	...	...	199	152
1911	...	...	209	160
1912	...	..	214	164

He concludes, however: " *This increase in* the volume of metallic currency does not, however, appear to have been larger than what has been required by the growth of businessand other demands for currency." Butsince his report there have been added to the circulation about 150 crores fo rupees newly coined, of which 120 crores were estimated to have been minted during the War years, and about thirty crores fresh coinage during the three years before the War; about 100 crores in round figures to notes in circulation; and a certain amount of gold coins, about £40 million worth of sovereigns *1 in all. Against the estimated total circulation of 214 crores of rupees and notes, in 1912 as reported by Mr. Datta, we shall be guilty of no over estimate if we put the total Currency resources of India at the present moment at 550 crores in all, of which rupees would account for at least 300 crores, notes for another 166 crores, and gold coins £80 million †2. Mr.

*1 In the table appended Mr. Datta has not included the number of sovereigns in circulation. We get the amount by the following table, compiled from the Report of the Controller of Currency.

Year.			Net addition of sovereigns in Public hands in million sturling.	
1901—02	...	...	£m.	·967
1902—03	...	...	,,	2·198
1903—04	...	...	,,	3·278
1904—05	...	...	,,	2·937
1905—06	...	...	,,	3·732
1906—07	...	...	,,	5·156
1907—08	...	...	,,	7·427
1908—09	...	...	,,	3·443
1909—10	...	...	,,	2·866
1910—11	...	...	,,	8·091
1911—12	...	...	,,	8·881
1912—13	...	...	,,	11·300
1913—14	...	...	,,	3,907
1914—15	...	...	,,	5,623

We cannot get accurate statistics regarding the absorption of gold coins during the War years. But the figures given here, if totalled, would show a total gold absorption in the first fifteen years of the present century of close upon £ 70 million = Rs. 100 crores at the old rate. It may be that for purposes of circulation the gold coins thus shown to have been absorbed into India may be left out of account, since there is reason to believe they might be used for hoarding purposes. But it must be remembered that these are coins, as distinct from gold bullion imported in almost equal quantity during the same period, and that, therefore, the probability is not quite so strong for believing that they constitute almost wholly the hoards.

†2 The estimates of existing circulation are based on the figures of notes and rupees said to have been coined or added during the period under review. It may be that now that the rupee is almost as valuable as coin as it is as metal there may have set in a greater tendency for melting or exporting it than was the case in the early years of the century. But the measures adopted by the Government rather incline us to hold that the tendency, if any, must have been checked almost at its inception, except for that portion of the export of rupees, unknown to the public, for which the Government itself must be responsible in connection with the Mesopotamia campaign.

Datta, in the table appended, found the rise in the Index numbers of nearly the same proportion as the rise in the volume of circulation, varying from year to year also in very nearly a direct ratio. He, nevertheless, as shown by the quotation, does not quite consider the increase in circulation as being responsible for the rise in prices, the increased circulation being, in his opinion, necessary by the expanding needs of the business. Even admitting his position, there is no reason to believe that corresponding to the increase in the circulating medium during the War years there has been a similar expansion in the volume of business. The total amount of foreign trade for example, as can be seen from the table given elsewhere, was not much greater in the War years than in the previous years. And, if anything, the Banking facilities during the War have been much increased, as shown by the opening of new banks, as well as the more extensive use of credit documents. Against the 585·82 crores worth of cheques in 1913-14, which was the largest pre-war number, there were 851·15 crores of cheques cleared in 1917-18 in the four clearing Houses of Bombay, Calcutta, Karachi and Madras. The Capital and Reserves, the Public and Private Deposits, all tell the same tale of increase. We cannot but conclude that this increase in the medium of circulation has an undesirable effect on the price-level.

The problem of financing the trade balance in favour of India, if dependance is placed exclusively on the coinage of new rupees, is bound to be unpleasantly complicated in the near future, and for some time to come. The world-production of silver is falling off as shown by the figures below, at a time when the world's demand for silver is rising to previously unthinkable proportions. The Government of India have been the most considerable buyers in the World-market and if that demand continues there will be no hope of reducing the price of silver, assuming that it is capable of reduction. The Government of India are in the unfortunate position of tying up their own hands in advance, by tacitly promising to convert the local into the International currency and *vice versa*. It will be no real solution of the problem to suggest the maintenance of the Exchange value by a reduction in the weight of the rupee. Not only would it be a breach of faith, which might be tolerated if the emergency was so desperate; it would introduce the most unwelcome confusion in the credit relations of private parties as well as the Government. The experiment, if tried, must face a not unreasoning distrust of the public as well as the possible eontaining on a much larger scale of melting operations. If we assume that there are at least 300 crores of rupees in circulation, of which one-half may be melted down by such a temptation, the Government would have to face a serious demand for rupees without improving their position in exchange very considerably. Their demand for silver, even to coin a debased coin, would keep up the world price against them. It is, indeed, possible that the snpply may be added to by such melting. But as far as the Government are concerued, if there be any truth in the legend about the hoarding propensities of the Indian people, there would be no relaxation of the strain.

World Silver Production.

Year			Million Oz.
1907			184·2
1908	...	...	204·2
1909	...	...	202·1
1910	...	...	222·0
1911	...	...	224·3
1912	...	...	216·3
1913	...	...	214·5
1914	...	...	213·6
1915	...	...	193·9
1916	...	...	177·4

The alternative of adding to the paper money in circulation is no better. As it is, the amount of paper in circulation, judging from previous experience, is beyond all reasonable requirements, even allowing liberally for the increased popularity of notes on account of greater familiarity forced by the War. The increase is not brought about by the natural process of normal expansion of credit and

the consequent supercession of cheaper for more costly forms of circulating media, but by the reckless additions in times and on account of the necessities of War. As against the slightly more than 20 per cent of the total currency issued against securities in the period immediately preceding the War, there is now nearly 70 per cent of the total circulation issued against such securities. And the bulk of these securities held in England are beyond the control of the Government of India, should they show a tendency to depreciate. The paper money, therefore, instead of offering a reliable, sound, solution for the present problem, constitutes itself one of the gravest problems of Indian Financial organization. Further additions to its uncovered portion cannot be contemplated unless inconvertibility is accepted as an ordinary correction of unfavourable exchange.

The rise in the exchange was the last remedy open to the Government of India to meet the growing balance of trade in favour of India, or at least to curtail it to manageable proportions. The Government were, indeed, aware of the gravity of such a step as much as their critics, if we are to judge from the too evident reluctance with which the responsible Finance Ministers resolved upon the step. It was in manifest opposition to the declared policy of the Government, if not in contravention of their solemn obligations, always to afford ready facilities for the conversion of rupees into gold and vice versa. There can be no dispute that the rise in Exchange would hurt the prospects of the export trade. The attempt was, indeed, made at first to justify the measure as a war necessity. But it was too painfully palpable that even when the war would be over there was no immediate prospect of restoring the old level of Exchange. It could be said, with some justification during the War, that the rise in exchange was not really materially a hardship to the Indian exporter, as his goods would be demanded no matter what the price. There was no effective competition, and the demand was almost unlimited so long as the supplier was willing to accept promises to pay in exchange for goods supplied. But now that the War is over, now that the trade restrictions against the erstwhile enemy countries have been removed, or are in process of removal; now that those countries, spurred on by the double incentive of defeat and indemnity, are likely to engage and be encouraged in the trade of the world with all the intensity that five years exclusion from the world markets could lend, all the advantage that a low exchange could afford, all the facilities that accumulated stocks of easily marketable commodities can supply; there is every reason to apprehend now that the trade of India would be most gravely prejudiced by these continued rises in Exchange.

There is an excuse for the Government of India in that the high exchange supplies them with abundant funds cheaply in England, enabling them to pay off their Home Charges at a much reduced cost in rupees. This is an argument entitled to respect from every financier interested in the stability of the finances of the Government of India. But before the argument can claim to be unanswerable, it must be observed that the saving to the Government, even if admitted, is not necessarily a saving to the community. Unless the money thus saved is returned in one form or another to the community, either by remission of taxation or by undertaking works of material benefit, there would be no occasion to plead this saving to the Government as a reason to excuse the rise in Exchange. If we are to judge from the last Budget,—the first Peace Budget of the Government of India, there seems no immediate prospect of either remission of taxation or undertaking of projects of moral or material welfare of the country in the near future. It may be that the war had ended but too recently when the last Budget was presented to allow us to judge from it of the course of

future financial policy; though it will be indisputable that for the next generation or so the effects of this war will be felt very severely in finance. Even admitting the saving to the Government it must be remembered that while on an average the Home Charges amount to £ 20 million, on which the saving at £ 1=Rs. 10 would be Rs. 10 crores, the loss to the trade on a total export trade of £200 million would be Rs. 100 crores. The saving to the Government would have to be very considerable, or would have to be most beneficially laid out, if it is to be regarded as an effective counterpoise for this loss. Finally, the argument from Government interest in the matter should not be pressed too much. If the constitutional reforms promised during the War are accomplished in times of peace in the spirit in which they were promised, the influence of the Home Charges ought to be a steadily diminishing factor. If the important posts in the civil and military administration of the Government of India are held in increasing proportions by the children of the soil; if the greater portion of the public debt of India is held by Indians in this country; if the expansion of Indian industries supplies all the civil and military stores wanted by the Government of India, the chief items of the Home Charges would begin to be unimportant,—at any rate they would not be sufficient to set off such a considerable loss to the producer as to make that factor entirely disregarded.

The rise in Exchange, we may take it then, entails a loss on the Indian producer without a corresponding benefit to the Government. In the near future the argument now frequently heard, that the rise in prices far greater than the adverse exchange would make the exporter's interest automatically safe-guarded, cannot be sustained. The World Price-level may, indeed, be maintained for some time by Labour organization or by State control. But if, as is probable, in the principal countries of Europe Labour consciousness succeeds in getting control of the Industry, it would be more in harmony with the Labour programme to reduce the profiteer's tax, than to maintain a high level of prices. The latter would be a burden on the consumer whose ranks are made of a very large proportion of the labouring population in every community. The device of reducing the output to maintain the prices is a Capitalist threat, which, the intelligent labour organizations of to-day will easily see, is inconsistent with the national or even the Labour interests. And all that labour need in justice claim would be obtained by eliminating the private profiteer and his tax on labour or on the community in the shape of high prices. Government control of industry if it does not restrain the selfish capitalist instinct, will fare poorly in the face of awakened consciousness of economic slavery of the rest of the community to the private industrialist. Besides, it would not quite be correct to assume that a high level of prices will be maintained for a considerable period after the War is over. The nations of the world who have been engaged in the struggle are all debtors enough to need to encourage by every means in their power exports. Germany, for one, if it is to pay the promised indemnity, must not only be not excluded from the trade of the world, but will find a large balance of exports as her only solution. The tales we hear of accumulated stocks of marketable commodities in Germany are enough to indicate the effect on the World Price-level if dumping on a large scale takes place. In any case India is not yet so completely freed from the character and needs of a debtor country as to make its Government indifferent to the interests of the exporter.

The only remaining plea that we need glance at in passing is: should the rise in Exchange discourage exports the Indian producer will find a compensation in the greater development of the Home market. The War-time activity in industrial development,

the pronouncement of Government in favour of rapid industrial expansion, and the ease of getting capital makes many people sanguine as to the future of industry in India. But the process, to be accomplished so completely as to absorb all the produce of India in the demands of India, must take time. If we are to judge from War-time phenomenon it may be said to have set in; and if the Government of India adopt a change of front and heartily take up the policy of encouragement and aid to Indian industries there may be hopes of a brighter future in that respect. But even if the goal of industrial development is accomplished and India's industrial ambitions are realised, the net result would be a change in the character of exports. Instead of raw materials being the principal item of exports, there would then be exported the monopolies of India or her manufactures. The interests of the exporter will continue to demand public attention so long as the principle of nationality is an accepted politico-economic axiom.

The only sound, permanent solution, then, that we can think of after a review of all the factors bearing on the situation is the adoption of the Gold Standard and a Gold Currency. The root of the whole trouble was the refusal of the commercial world to let India have her share of the Gold of the world during the last five years. While the gold reserves of other countries have increased during the War to the extent of the marginally noted amounts India got less than one-fifth of her usual share. The Gold Exchange Standard sound perfect in theory; but it must be admitted to have lamentably broken down in practice. The Government of India cannot fix an artificial value for the standard local coin, promise to maintain it at that figure against all contingencies, and then, at the first reverse in the bargain, try to back out of the transaction altogether. We would not say that the breach of faith involved in the recent putting up of the Exchange was deliberate; but any body can see it is disastrous. In gold using countries, moreover, the present paper standard has put up the price of gold beyond its legally fixed volume; and the gold producer may well threaten the reduction of output if remunerative returns are impossible. But in India the price of bar gold at Rs. 33½ per tola works out at Rs. 89 per oz. by no means prejudicial to the gold producer. If left free to settle her trade balance in the customary manner India would obtain sufficient gold to keep a stable exchange without the artificial meddling with that factor by the Government more frequently influenced by fiscal than by trade considerations. Gold in circulation, moreover, would not only relieve the pressure on silver rupees it would remove the present ominous preponderance in the paper circulation, un-supported by an equivalent or even a safe metallic Reserve. The apprehension is felt in some quarters that gold in circulation would be inaccessible in times of panic for the settlement of international obligations. Judging from the habits of the people it may be predicted that a certain proportion of gold would be so absorbed as to be unavailable for Currency purposes, though it must be observed that the course pursued with respect to that metal, during a period when it was really a commodity and not a medium of exchange legally established and commercially used, will not be a good indication for judging of a similar tendency when it is made legal tender standard money of the country. A large proportion, however, of the gold coins must remain in circulation and be accessible in times of international financial difficulties. If it is not so the reason would be the restricted use of bank-paper. This is, indeed, the gravest of the defects of Indian currency and financial organization the absence of up-to-date, flexible banking facilities. With a well developed system of banking the huge Government balances would not remain for ever closed to trade. With a well organized system of banking, adopting metal saving devices like the Giro system of payments of the Reisch Bank of Germany, the fears of inaccessible hoards of gold will practically be groundless. And, if the note-issue is handed over to such a central State Bank as alone can claim and maintain the dominion of the Indian Money market, the

use of cheaper forms of currency will be very much encouraged. With a rupee of varying value, the paper based on it will always share in the distrust aroused by the variation in the value of the principal. The conversion of the notes in terms of the gold Standard, and provision for immediate convertibility in gold will add to the popularity of the notes merely increasing their circulation. And, if in re-organizing the Currency system, the expedients they have adopted in the United States Federal Reserve Notes are introduced, we would have a reserve for notes which could with the greatest facility be converted into the form of commercial credit or Government credit as occasion may require; at the same time that the principle of immediate convertibility and equivalent Reserve are fully maintained.

The marginally noted amounts referred to in the previous page are:—

U. S. A.	... £.m.	250
Spain	... ,,	70
Netherlands	... ,,	43
Switzerland	... ,,	10
Scandinavia	... ,,	40

It is of course, true that the changes here advocated, the adoption of the Gold Standard with Gold Currency, the re-organization of the Note system and the reform of Banking in India, will take time. But the moment when the Indian Exchange Committee is investigating the whole system will not be badly chosen to suggest such fundamental reforms. The plea may indeed be urged that if adopted the reforms would become impossible owing to the sheer inability to obtain Gold at present. The simple answer to that plea is that India has sufficient amounts owing to her in gold (Rs. 82 crores in the Paper Currency Reserve and Rs. 30 crores in the Gold Standard Reserve) to justify the claim of these suggestions to be practical unless we assume tacitly the bankruptcy of our debtors. If it be found that the debtors must have time to return their loans, the course may be adopted of issuing Bonds of a definite limited currency, specifically secured on the outstanding credits of India in the gold-using countries, and thereon the Currency reform may be undertaken in both its branches, metallic money and Paper. Short of this radical remedy, we fear all other tinkering with the system will only end in making the problem perennial, in upsetting trade and industry in India, in gravely prejudicing the interests of the Indian produc

THE INCOME-TAX IN OTHER COUNTRIES.

By R. K. Sangameswaran, MA., L.T.

THE recent proposal of the Government of Mysore to levy an income-tax ought to be still fresh in the mind of every one. At a time like this it may not be out of place to briefly consider the nature of the income-tax and see how it is levied in other countries. A tax that is resorted to by every one of the most advanced and progressive countries has in itself a strong recommendation for its adoption in this State; but yet it would not be unprofitable if we examine its place in the public finance of other countries and learn how to utilise it most profitably in our own.

All the levies made by a State can be divided into two broad classes. In the first class there is a direct exchange of services between the State and the contributor, as for instance in the fees levied by the post, telegraph or registration offices; while in the second class, the contributor who pays a levy to the State does it without expecting any services directly in return, as for instance in the land tax. This latter class of payments made by the subjects of a state, characterised by a compulsion and by the absence of any direct service in return is called a tax. The total amount of the taxes collected is the public revenue, which is utilised in the public services for the common good, such as the maintenance of roads, the police, the army, etc.

Taxes are of different kinds. From the earliest times taxes on land and real property have been the mainstay of all governments in every part of the world. With the extension of trade and commerce and the development of industries, customs, excise and other duties contributed a fair share of the public revenue. These are called indirect taxes, for the reason that they are collected indirectly

by methods of which we are 'but dimly conscious'. As civilisation advanced and the sphere of public activity of progressive governments widened, the public expenditure also rapidly increased, and with it the necessity arose for increased revenue by new taxation. The increase in national wealth, and the extensive application of machinery in production rendered possible a field for fresh incomes and therefore, an opportunity for fresh taxation. Thus slowly came into existence, new taxes like the income, inheritance and general property taxes. These taxes have been called direct taxes for the reason that they are collected directly from every person possessing the income or the property.

Questions of justice and equity arise, especially in direct taxation. Is it just to levy an income-tax on all persons from the common labourer to the millionaire? Again, if all have to pay, are they to pay equally, or in proportion to their incomes or more than in proportion? It is considered a great social injustice if the poor man is taxed directly for he has hardly "the means of subsistence." Therefore, in all countries it is now the universel practice to levy the income-tax only upon the comparatively well-to-do classes, all persons having incomes below a certain sum being exempted. Thus it is that incomes below £160 are exempted in England (1898 Reg.); incomes below Rs. 2,000 in British India (1918 Reg.); incomes below 900 marks in Germany.

The fixing of the minimum may be looked at from another standpoint. Apart from the universal discontent and heart burning that would result in case the income-tax reaches very small incomes, any government would find it ruinously expensive "to collect from millions of working men a few dollors or shillings each."

The income-tax was not brought into existence in any country, with the avowed intention of taxing the rich. In most cases it was first resorted to as a temporary measure to meet a financial emergency, although later on it became an undispensable feature of the fiscal system. In England, for example, the income-tax was imposed for the first time by Pitt in the year 1798, when an addition to the State revenue was an imperative necessity. When it assumed its present form in 1803, it was tacitly understood to be a temporary measure. It lapsed in the year 1816, when the period of financial stress was over after the great continental wars. After an interval of twenty-six years, it was again revived as a temporary measure in 1842 and has had an uniuterrupted existence eversince. At present it is one of the most important features of the British fiscal system; but yet, curiously enough, the stump of temporariness still continues as it is renewed annually.

By the act of 1898, incomes below £160 are exempted in England. Some idea of the productivity of the tax, at the beginning of this century, could be had from the fact that in 1899 each penny of the tax was estimated to yield £2,248,000. The rate of incidence varied from year to year the average being about 8*d.* in the pound. In 1874-76 it went down so low as 2*d.* in the pound and in 1855 rose as high as 16*d.* in the pound. In this century, again, it was 16*d.* in the pound during South African War (1902), while at the outbreak of the great European War (1914) the rate was enhanced to 2/6 in the pound. Another feature of the British income-tax system is the abatement on income between £160 and £700, *i.e.*, the full rate of tax is levied only on incomes above £700. Further the rate of abatement was made to depend on the nature of the income in 1907. In 1910, the principle of progression was also established by a 'super-tax.'

While the income-tax occupies a prominent place in the public finance of a prosperous industrial country like England, in a poor country like India it is conspicuous by its poor yield. In the year 1913-14, the revenue derived from the tax was £1,950,250 out of a total revenue of £85,207,175,

At its inception, in 1886, and during its revision in 1916, the difficulty and opposition met with from the public was considerable. For those that would be subjected to the tax are fairly rich and belong to the commercial or upper classes, and, therefore, capable of sufficient influence in resisting the imposition of the tax for one reason or another. In the words of Sir John Strachey,* "there is no country where a tax upon incomes is more just than in India, but there has been difficulty in imposing and maintaining it because it has been opposed by the richest and most powerful classes, who alone can make the voices heard."

The tax in its present form was first levied in the year 1886,† all incomes below Rs. 500 being exempted. The minimum of income assessable was, however, raised to Rs. 1,000 in the prosperous days of 1903, by Lord Curzon. During the great war, the Government of India, being hard pressed for money, introduced (in 1916-17) the principle of progression, as well as a super-tax on all incomes above Rs. 50,000. These changes were expected to yield £6,313,200, out of a total revenue of £108,346,900, in the budget for 1918-19. For reasons not quite apparent the assessable minimum was raised to Rs. 2,000 last year.

Progression seems to be the order of the day in direct taxation. For income and inheritance taxes, some scale of progression or other has been adopted in all countries. This device seems to be in harmony with popular sentiments and appears to have been adopted as a set off to the great inequalities in wealth, so characteristic of society in modern times. The spirit of 'democracy' and 'equality' is satisfied a little if recourse is had to the principle of graduation in direct taxation. The following tables illustrate the scale of progression in Income and Inheritance taxes in other countries :—

*India: Its Administration and Progress.

† Before that year there existed a 'license tax' on industries and professions.

I. Income-tax.

1. United States (1913).

Amount.			Tax.
From $ 4,000	... up to $ 20,000	...	1 per cent.
20,000	... 50,000	...	2 ,,
50,000	... 75,000	...	3 ,,
75,000	... 100,000	...	4 ,,
100,000	... 250,000	...	5 ,,
250,000	... 500,000	...	6 ,,
500,000	... ...	...	7 ,,

2. British India (1916-17).

Amount.			Tax.
Rs. 1,000	... up to Rs. 2,000	...	4 pies in Re.
2,000	... 5,000	...	5 ,,
5,000	... 10,000	...	6 ,,
10,000	... 25,000	...	9 ,,
25,000	... ...	...	1 anna ,,

Super-tax.

50,000	... up to 1 lakh	...	1 anna ,,
1 lakh	... 1½ ,,	...	1½ ,, ,,
1½ ,,	... 2 ,,	...	2 ,, ,,
2½ ,,	... ...	...	3 ,, ,,

II. Inheritance Taxes (Examples of Progression.)

1. English Estate Duty (1894).

Amount.			Tax.
From £ 100	... up to £ 500	...	1 per cent.
500	... 1,000	...	2 ,,
1,000	... 10,000	...	3 ,,
10,000	... 25,000	...	4 ,,
25,000	... 50,000	...	4½ ,,
50,000	... 75,000	...	5 ,,
75,000	... 100,000	...	5½ ,,
100,000	... 150,000	...	6 ,,
150,000	... 250,000	...	6½ ,,
250,000	... 500,000	...	7 ,,
500,000	... 1,000,000	...	7½ ,,
	over 1,000,000	...	8 ,,

2. French Inheritance tax (1901).
(Direct line.)

Amount.			Tax.
From Fr. 1	... up to Frs. 2,000	...	1 per cent.
2,001	... 10,000	...	1·25 ,,
10,001	... 50,000	...	1·50 ,,
50,001	... 100,000	...	1·75 ,,
100,001	... 250,000	...	2·00 ,,
250,001	... 500,000	...	2·50 ,,
500,001	... upwards ...	...	2·50 ,,

[From the table of Solomon Herebner, N. Y.]

In any tax system the criterion of a good tax lies in the comparative ease and efficiency with which it can be collected. In the case

of the income-tax there are two modes of collection. It may be collected directly from the persons whose incomes are above the taxable minimum. This direct method is in vogue in continental countries including Germany, where a trained class of officials do the difficult and often the delicate work of ascertaining each individuals income by declarations, often assisted in each locality by persons of position and influence, 'who are in the know.' From the very mode of collection it is obvious that this system is readily adaptable to progression.

Another method known as the 'stoppage at the source' is practised largely in England and British India. In this case the tax on the income of a person is not collected from the individual directly, but is deducted from his income before it reaches him. For instance, the income of a company as a whole, is taxed, and when the dividends are distributed to the shareholders each of them gets his amount diminished proportionately. The same thing is done by Government when it pays interest on the national debt or salaries to its servants, and by banks while forwarding foreign remittances to its customers. Thus three-fourths of the British Income-tax is collected "without a word of enquiry or a possibility of evasion", the only exceptions being the earnings of lawyers, physicians and the like, where a direct collection by declaration is resorted to. The great advantage of this system lies in the fact that the tax is collected efficiently by a comparatively inexpensive machinery. It is, however, not easily adapted for progression, as a man's total income is not declared, since the tax is collected severally by stoppage at the sources. "Notwithstanding the administrative advantages thus secured by refraining from the attempt at progression, the British income-tax has been remodelled in very recent years precisely in the direction of progression"* (see p. 4).

* Taussig: Economics, Vol. II.

The income-tax occupies a unique place in the annual budget of certain countries. On account of the facility with which the tax can be increased or diminished, without trouble or change in the machinery of collection, it is of immense practical advantage in the hands of a skilful finance minister. Not only does it afford a ready means of realising additional revenue in times of national emergency, but it is also specially adopted for the adjustment of public income and expenditure from year to year. In this respect the skilfulness with which the British income-tax has been manipulated deserves attention; as we have seen the rate varies with the need of the year (see p. 4) and the readiness with which an increased revenue has often been secured by enhancing the rate, is a clear proof of the flexible nature of the tax.

In poor, backward countries like India or the Native States, the income-tax cannot play this *role*, as it is neither rich in its yield nor adjustible from year to year without great opposition. But yet it would be wise to keep the tax as elastic as possible, by imposing it in such a way that the tax would not be felt as a burden; so that it is capable of a ready increase in times of emergency, like famine and war.

From a study of the nature and mode of administration of the income-tax in other countries, it must now be evident that a tax of this kind in this State ought not to meet with any opposition. The poor and middle classes are already taxed enough and should, therefore, not be burdened further to contribute to the increasing public expenditure, as a result of the extension of public activities in newer and ever widening spheres, such as, education, sanitation and the promotion of 'all art and the higher interests of life'. In this glorious duty of the government it is but right that "the classes of the country who derive the greatest security and benefit from the governmont"* should contribute their share of the public burden.

* Sir A. Colvin.

Nor is this State unique in extending the sphere of public activity in newer channels. It appears to be a world movement; for as Professor Wagner* puts it—"Comparisons between different countries and different periods show regularly among progressive nations an extension of public activities. This manifests itself extensively and intensively. The State and its subordinate political units continually undertake new functions and they perform their duties, old and new, better and better. In this way, that is through public agency, the needs of the population to an increasing extent, especially their common needs, are satisfied; and the public services for the satisfaction of needs continually improve in quality. The clear proof of this is given statistically in the increased demands made by the State and the subordinate political units."

The formation of an American Foreign Trade Corporation, with a capital of £4,000,000 for Trade and Commerce with the Near East is an event of considerable importance, for it indicates very clearly the intentions of America with regard to the trade enterprise in that part of the world.

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Wood block paving which in European cities has long been the favourite, is increasing in use in Canada, despite the frequent clumsy methods used by Town Engineers in laying it. Rightly laid it is an ideal paving material.

*He calls it the "Law of Increasing Public Expenditure". On this interesting topic R. Ely's *Evolution of Public Expenditure* may be consulted.

THE STANDARD OF LIVING IN INDIA: ITS INFLUENCE ON PRODUCTION.

K. KUNHIKANNAN, M.A.

THERE is hardly a subject about which there is greater misconception in the popular mind than the standard of living in India and its influence on production. The accepted theory in regard to the interaction of these two factors becomes inverted, when it is applied to India. Opinion is inclined to the view that the vast resources in India remain for the most part undeveloped largely because the average level of consumption is so low and recently William Archer has gone so far as to declare that for India to be in a line with the Progressive countries of the West she has 'to learn to want more wants.'

This view may pass for acceptance unchallenged. It is easy to assume that the environment in India has affected adversely the health and strength, the character and energy, of her people. Nature has been too prodigal in her gifts and life lived mostly in the open and without the discipline of a winter, has been too easy to develop the more virile virtues, which exist only, where the task set to man is heavy and exacting. The ideals and institutions of the people are pointed out as reflecting many of these depressing influences. There are tenets in Indian philosophy, which may be brought forward in support of the theory that in their struggle with the environment, Indians have lost far more than they have gained and that they have gradually been forced to reduce their wants to the level of their limited energies.

The argument is plausible but cannot stand close examination. Those who accept this line of reasoning forget that Indian Industries and Commerce were flourishing for several centuries and that stagnation set

in only so late as the eighteenth century. There is no reason to believe that the people who for so long as fifteen centuries resisted the enervating influences of nature, suddenly succumbed to her viles, spoiled by her gifts, and lulled to her langours. As for the depressing influence of Indian philosophy, even if we accept it, as a correct description of what is in many respects one of the most remarkable achievements of human thought, it should suffice to point out that for all the spiritual elevation of the Sermon on the Mount, Christian Europe has remained distinctly material in aid and endeavour.

It is equally absurd to argue that in India human wants are few and easily gratified without much exertion. The fifty millions, who are said to be on the verge of starvation even in normal years, live on their one meal a day, not certainly from choice. In their case the want has all the intensity of a privation but nevertheless fails to rouse them to the exertion necessary to add to their scanty subsistence. India has certainly wants enough without learning 'to want more wants.'

We are led to these absurdities because the symptom is mistaken for the disease. The standard of living in all countries, does little more than reflect the productive effort of the people. It is causal in so far as it may in its turn influence production and in India it can be shown that it has less influence in this respect than in other countries. The primary factor everywhere is production. When men produce on a large scale the increasing wealth soon manifests itself in a rising standard of living. When production is low the standard deteriorates. It does not, however, follow that when the standard of life rises production necessarily keeps pace with it. The British workman has had a very fair share of prosperity during the last few years and his period of work has been reduced to forty-eight hours a week. There has been nevertheless a considerable falling off in the output of British manufactures which if it continues may tell heavily against England. Production depends then not so much on the standard of living. It depends rather on the proper adjustment of effort and opportunity. Where one is weakened by physical and moral prostration, the other restricted or denied and both dislocated from their natural and healthy relation, the argument of tropical sluggishness ceases to be convincing.

The environment has its influence on the Indians. Their needs are less urgent. The shelter from wind and weather is simpler in character. But the reaction of this comparative simplicity of Indian life, on productive effort, has been to a large extent prevented by the customs and institutions of the people. If we grant, as we must, the force of inherited aptitudes and the influence of surroundings, on the individual under the caste system, it must be admitted too that, to the extent of these influences, the productivity of the various castes was rendered independent of their standards of life. We have evidence of that independance in the survival of the handloom and the devotion of the weaver to it, in spite of the fierce competition and the abject deterioration in his condition. So too with the joint family. There are those who see in it nothing but ruin and disaster for India. A great deal of the condemnation appears perhaps deserved when it is seen amidst the disintegrating influences at work to-day. But rightly viewed, in the social order appropriate to it, the obligation of support and helpfulness on a large circle of relations which it imposed on the individual under spiritual sanctions, sharpened the appetite for work which is said to get weak under the stress of the tropical heat. If it is found to-day to make far too many dependants on the successful member of the family, it is because the opportunities of suitable employment are few or do not exist. In any case there are not people wanting even now who but for the restraint

of a large circle of relatives and dependants, would exchange their productive activities for the inanities of the sack cloth and begging bowl.

The joint family made for a more equitable distribution of wealth. Under it the contrasts of wealth so common in the individualist societies of the West were not possible. On the other hand, the poor were more secure from starvation and neglect.

The standard of living in India is low, not so much because of the enervating climate, of a depressing philosophy or of 'status-fostered indolence,' but because there have been forces in operation, historical, political, and economical, over which Indians have had very little control. The political confusion in India right up to the nineteenth century was not calculated to stimulate production. Yet her industries and trade were saved from dislocation largely by the caste organization. Her prosperity was still at a high level when Europeans appeared in India. With the peace that settled over the country after the conquest by the English, the productive activity of the people should have increased. On the other hand, it received a serious set-back. Many of her trades and industries were ruined or killed by a series of tolls and tariffs which gave undue preference to English goods. The Industrial Revolution hastened and free trade completed the process.

The decay and ruin of Indian industries compelled large sections of the population supported by them to resort to agriculture. To the same profession flocked the disbanded soldiery, whose services were no longer required by Indian States, now prevented from mutual wars by the supreme power. Under the security of life and property now assured, the people began to multiply, to further increase the ranks of the agriculturists. The rapidly increasing pressure on land was not perceived until large tracts of abandoned or virgin soil were brought under the plough. This stage was not reached for some time, but when it was, the consequences of this wholly one-sided development of Indian production became visible in the rapid fragmentation and attention of holdings which are universally admitted to be serious obstacles to agricultural improvements.

There were other factors to depress agriculture. The total volume of agricultural produce indeed increased considerably but the yield per acre tended rather to decrease. The conservation of forests involved restrictions on the facilities of grazing and of obtaining firewood enjoyed by the ryot population from time immemorial, which affected the agricultural stock by diminishing the food supply and necessitated the conversion into fuel of a great part of the cowdung hitherto used as manure alone. A third influence at work was the disorganization of credit. The prosperity of agriculture had in the main depended on the richer landlords who helped their poorer neighbours with loans of money and seeds. The tendency of the joint family system to favour the growth of a peasant proprietory at the expense of large landowners had to a large extent been checked under Indian Princes by their throwing on the country a continuous supply of retired officers both civil and military provided with properties which descended by the law of primogeniture. The new rulers looked upon these men who supported the agriculture and industries in their neighbourhood and who weilded no small influence, with suspicion and distrust. The law of entail was not recognised in regard to their estates which were consequently broken up and brought soon to the level of riotwari properties. The disappearance of this nobility and gentry led to an increasing dependance on money-lenders whose exactions received the support of British courts to an extent seldom allowed by Indian Rulers.

Nor were the revenue arrangements made in the early years of the nineteenth century calculated to further the progress of agriculture. The new rulers of the country mistook the assessment they saw levied by Indian Rajahs under the exceptional conditions of political confusion, for the normal

share they could permanently claim. In thus regulating their taxes with reference to an abnormal standard they invariably imposed an assessment too heavy for the ryot with the additional disadvantage of a rigidity which taxes never had under indigenous rule. The first experiment in land settlements proved ruinous to royts all over India. To give but one example under the first settlement in Bellary out of 2,644 villages no less than 1,800 reverted to British hands for arrears of Revenue. These initial mistakes have since been largely rectified.

As indicating the direction of the forces at work the results of the investigation of a Deccan village by Dr. Mann and his assistants are of very great interest.

About the progressive decrease in the size of holdings they write as follows: "It is evident from this that in the last sixty or seventy years the character of the land-holdings has altogether changed. In the pre-British days and in the early days of British rule the holdings were usually of a fair size most frequently nine or ten acres while individual holdings less than two acres were hardly known. Now the number of holdings is more than doubled and 81 per cent of these holdings are under ten acres in size, while no less than 60 per cent are less than five acres. The economic condition of the village is described as 'disheartening'. The debts are a crushing load on the people but even were they removed more than half the families (228 people) would still not be able to pay their way, counting personal expenditure at their own standard (Rs. 4-8-0 per adult male per month). And this is the case when outside employment was particularly active, when no less than 30 per cent of the population were employed at fairly good rates at Kirkhee."

Pimpla Soudagar is a typical village of the Deccan, not of all India. It is cited here to indicate not the effect but the direction of the forces at work. Even were the conditions generally in Indian villages only half as bad as they are in Pimpla, we have a very serious state of affairs sufficient to account for the deficiencies in the quality and quantity of Indian production. But productive effort is adversely effected not alone by defective nutrition. The lowered vitality resulting from it paves the way for diseases. In one of the appendixes of the report of the Industrial Commission stress is laid on this important factor. The toll levied by malaria reaches several millions annually. The anaemia that follows it in those that survive the disease does not make for efficiency. The hook-worm which in some villages in South India and in Bengal is said to effect cent per cent of the population produces the same disastrous effect. Much of the differences between the Northern and Southern inhabitants in the United States as regards productive efficiency was for a long time attributed to the proximity to the Tropics of the latter but has now been definitely traced to hook-worm. So too has the efficiency of the Philippines increased with the gradual stamping out of the nematode. It is equally certain that a similar campaign against it in India would give equally encouraging results.

But were all these factors removed, Indian efficiency would still be at a lower level than in the West. Productive effort is at its maximum in a competitive stage of society, where the market is to those alone who utilize in the best way possible the resources of science and machinery. But in agricultural pursuits especially on the small and scattered holdings of India the personal factor is not so important, as there is little of the stress of competition to induce men to work under high pressure. And when it is remembered that 70 per cent of the population are engaged in rural occupations and a large proportion of the labour found in town is drawn from them, the comparative inefficiency of Indian labour becomes apparent. There can be no doubt, however, that with the advance of India to a competitive stage, Indian efficiency would improve.

The standard of living in India appears then not to have been fixed by her climate, her philosophy or her religion. Rather it has reached the present low level as a result of a gradually increasing deficiency in Indian wealth brought about by narrowing down her activities to the one branch of Agricultural production and by allowing the growth even in that limited field, of serious obstacles which have unsettled the connection between industry and reward. With the provision of suitable facilities and the removal of these obstacles Indian production is bound to increase in volume and the greater wealth will soon become manifest in a higher standard of living.

MYSORE ECONOMICS—III

Agriculture—Facilities for Transport of Labour, etc.

By K. Subba Rao, B.A.

ONE of the most urgent requirements of the State is the provision of adequate facilities for the easy transport of agricultural labour, perishable produce, implements and seeds, and manure (oil cakes, etc.,) from one part of the country to another. The difficulties which exist at present are truly formidable and they act as a great deterrent. I shall illustrate it by reference to actual facts. Some years ago I had gone to Hiriyur for ascertaining the agricultural prospects of the lands under the Vanivilas Sagara (Marikaneve Channels). Some of the enterprising ryots who had migrated there all the way from the fertile District of Trichinopoly, asked me how they could find a market for fruits and vegetables; especially plantains which on the day they were there, they had plenty to export and how they could transport labour from abroad easily. The distance from the Railway is prohibitive. In almost every District and especially in the Chitaldrug, Kadur and also in the Mysore Districts, similar tracts may be found. There is plenty of land to cultivate. But where is the labour to come from? and if produce is abundant, how are arrangements to be made for immediate transport to stations where they are sure to find a ready sale? The bullock cart is no doubt invaluable and even in the War it has played an important part. But for agricultural improvement of a permanent character, along with the bullock carts, there should be also speedier means of locomotion.

Some years ago Diwan Bahadur Mr. J. S. Chakravarti had drawn up a scheme in connection with the Conference for the introduction of motar transport in all the Districts of the State where such transport is urgently needed. But some how the scheme was dropped. We have to revive it without loss of time if the total output has to be increased.

Railways naturally take time for construction. The eost of iron and other materials has increased so greatly and there is so much unrest in Europe in almost every trade, that there does not seem to be any reasonable prospect of Railway construction at the pre-war rates in the near future. The Government have on hand already railway projects and their completion is likely to take several years. Further extensions would well-nigh take us to very long periods from now. Agricultural progress in Mysore cannot surely wait indefinitely till all the Districts are covered thoroughly with railway lines in active work.

While following without laxity the Railway policy on hand, the country has to be opened up immediately in all parts by a bold utilization at once of motor vehicles both for transport of men and agricultural produce,—especially the perishable ones, and seeds and implements and of food products like milk, ghee, butter, vegetables, fruits,—etc., in all parts not affected by the Railway. It is necessary to grant by legislation a monopoly of traffic for some years to Companies or Syndicates willing to provide efficient cars and to fix fees on a scale approved by Government. The roads should also be maintained in a condition fit for motor traffic by the Public Works Department, the Local Fund Boards and the Municipalities concerned. Motor syndicates are as great benefactors to the public as Railway Companies and are entitled to as many concessions as the Railway Companies enjoy. These will disappear as soon as they are displaced by Railways. At tbe commencement even interest up to some limit may be guaranteed. The subsidy thus paid would be more than compensated by the increase of agricultural

produce, the migration of more agricultural labour and the higher profits which ryots will get by readily selling their perishable products and by getting at less cost and in less time the articles they require from the capital cities of the State. In America even private owners of land of ordinary dimensions carry out their ploughing, sowing, harvesting and marketing operations through their own motor vehicles. In some parts of the world the State lays the Railway lines, marks the fields, builds houses and then settles labour and capital on the land by giving large advances as working capital. Is it then too much to ask for the establishment of public motor service at no cost to the Government except a few concessions and sympathetic guidance.

Motor syndicates need not necessarily mean foreign syndicates. If a statement of policy is announced, then capitalists within the State with the co-operation and active association of the motor companies in Bangalore, Bombay and Madras, may be able to supply the necessary cars for passenger and goods traffic and arrange the details as effectively as for transport by railway.

The *Malnad* and the *Maidan* Districts will both benefit immensely by the scheme and in the case of the *Malnad*, even the payment of a moderate subsidy to the Motor Companies, would result in speedy agricultural prosperity and the *Malnad* improvement schemes of all descriptions would be more fruitful of good results than at present. In these days of air ships, it is not possible to expect any appreciable improvement in agriculture if up-to-date facilities for transport of the necessary labour and produce is not sufficiently supplied.

Unless more capital is invested in land and more labour is employed, it is not possible to get the maximum quantity of crops from lands at present under cultivation and to bring under cultivation new lands. Labour has to be imported from one part of the State to another and also from abroad from the neighbouring Districts of the Madras and Bombay Presidencies whenever possible. Capitalists from abroad have also to be invited to take up lands if the area under cultivation has to be appreciably increased. The increase of area under cultivation and settlement of labour will in the long run add to our population which has been seriously affected by Influenza and Plague. But the want of speedy transport within the State is now a great hindrance and until it is removed, progress is bound to be phenomenally slow.

I therefore assign to this subject the very first place in the programme intended for increasing the total output of agricultural produce in the State.

At the first General Meeting of the Bombay Central Co-operative Institute held on the 23rd Aug. 1919, the first Report for the period ending 31st March 1919, was read. The report covers a period of six months only —from 2nd October 1918. Much of this time was spent in spade work. The brunt of all the initial work was borne by Mr. R. B. Ewbank, I.C.S., the Registrar. The Hon. Lalubhai Samaldas is the elected Vice-President of the Institute, and H. E. Sir George Lloyd has kindly accepted the Presidentship. To carry on the work of the Institute in its different departments, the following Special Committees exist:—Committee of Secretaries Training Classes; (2) Committee for Night Classes and other Social Work, (3) Co-operative Housing Committee; (4) Committee of Co-operative Quarterly; (5) Committee of Co-operative Study, Propaganda and Inquiry; (6) Organization Committee; and (7) Committee for other Co-operative Work. From the brief account of the work done by the different Committees, it is evident that the work of the Institute is yet in the stage of commencement, and its accomplishment depends much on the whole-hearted support of workers in all the differents parts of the Presidency. The Institute has requested Government to make an annual grant of Rs. 4,000, and it is hoped that Government will see their way to sanction the amount.

THE STORY OF THE CANADIAN PAPER INDUSTRY.

BY THE EDITOR.

WHILE we are talking of a paper industry in the Mysore State, the people of Canada have developed their paper industry to an extent which is striking to a degree. It is impossible to overestimate the importance of developing our paper industry on sound lines. We have an abundance of raw material in the State in bamboo, straw, cotton stalks, soft woods, waste paper, etc. The question of the utilization of bamboo for paper has received considerable attention in recent years. The practicability of extracting of good writing paper from it has been demonstrated by experts and the possibility of the manufacture of strawboards from paddy straw has also been fairly thrashed out. What is required is the spirit to look at the question from a business point of view. The market conditions now are such that the manufacture of paper in Mysore would be facilitated to an extent undreamt of in the years gone by. The organization required for turning what is now really running to waste into a useful manufactured article may be put together without undue difficulty if the people of the State look at the question from a broad business point of view. The need for taking greater interest in the matter will be better understood when we state that British paper manufacturers are turning to the bamboo as a cheap and dependable raw material for their future supplies. More than that they are taking up land in bamboo areas and even planting up the same with bamboo to future needs. In India and Burma steps are being taken to utilize bamboo extensively in paper production. With these facts before us, we cannot afford to leave the question of a paper industry in Mysore for an indefinite length of time.

The story of the progress of the Canadian paper and pulp industry as unfolded in a recent report issued in the Census of Industry Series by the Canadian Bureau of Statistics is of such absorbing interest that we give below the main portions relating, with a view to stimulate the interest of people in the State interested in industrial matters. The report shows the immense development that has taken place during the four years of the War, 1915-1918. If the report helps our people to realize even dimly the possibilities of an industry of a similar kind in Mysore, it will not have been referred to in vain by us in these pages.

The report, as we have said above, shows a considerable growth when the statistics in the present report are compared with those of 1915. In 1915 the number of active mills was 80, and the value of production $40,348,001. In 1917 there were 83 mills in operation, with a production of $96,340,327, an increase in the latter year of nearly 140 per cent, as shown in the report. Another important measure of growth, according to the report, is found in the consumption of pulpwood, which in 1915 was 1,405,836 and and in 1917 was 2,104,334 cords, or an increase of nearly 50 per cent during the same period. The total cut of pulpwood was 2,355,550 cords in 1915 and 3,122,188 cords in 1917, exports of pulpwood having risen from 949,714 cords in 1915, to 1,017,854 cords in 1917. The production of wood-pulp in Canada in 1917 in all classes of mills amounted to 1,464,308 tons, compared with 1,296,084 tons in 1916, and 1,074,805 tons in 1915. Of the 1917 product, 804,472 tons were used by the producing mills in the manufacture of paper, while 659,836 tons were made for sale. The amount received for pulp sold was $ 32,824,626, or an average price per ton for all classes of pulp of $ 49·75. The average value of the different kinds of pulp made for sale was $28.06 for ground wood, $ 72.31 for sulphite fibre, and $ 68.26 for sulphate fibre. The export price of

mechanical or ground wood pulp in 1917 was $ 28.32, and of chemical pulp, $ 73.01. The value of the entire output of wood pulp, if calculated at the average price per ton realized for that portion which was sold, would be $ 72,849,323.

The consumption of pulpwood in all mills making pulp, whether purchased or cut from own limits, was 2,104,334 cords, of the value of $ 18,817,483 in 1917, as compared with 1,764,912 cords, valued at $ 13,104,458, in 1916, and 1,405,836 cords, valued at $ 9,426,217, in 1915, or an increase of 688,498 cords, or nearly 49.7 per cent in the two-year period. The average price per cord was $ 6·71 in 1915, $ 7·42 in 1916, and $ 8.94 in 1917, an increase of $2.23 per cord, or nearly 33·2 per cent in the two years.

The order of importance of the five provinces remained the same as in 1916, Quebec leading with 1,109,869 cords, or over half the total. Ontario was second with 735,691 cords, or over a third of the total. British Columbia was third with 134,814 cords, New Brunswick fourth with 105,586 cords, and Nova Scotia last with 18,374 cords. The quantity of pulpwood consumed in each province is an increase in every case, as is the average value per cord of wood.

Spruce continues to lead all classes of wood, being 79.7 per cent of the total in 1917, balsam fir and hemlock being next in order of importance. These three woods all show increases from 1916. Poplar and pine show decreases from the preceding year, and tamarack and cedar are reported from British Colnmbia for the first time in several years.

The greatest proportion of the wood used still goes into the manufacture of ground woodpulp, although the three chemical processes are making heavier demands on the wood supply each year. In 1915, 52·9 per cent of the wood was used in making ground woodpulp. In 1916 this proportion decreased to 46·9 per cent and a further decrease to 45·8 per cent is recorded for 1917. The increase in the proportion of wood used for the manufacture of chemical pulp does not represent an equal increase in the production of pulp by these methods. Where over a ton of pulp per cord of wood is produced on the average by the mechanical process, only 1,105 pounds are produced by the sulphate process, 1,063 by the sulphite process, and only 930 pounds by the soda process.

The mechanical process does not demand the use of the most expensive grades of wood, and the average value, $8·07 per cord, is therefore the lowest on the list. Certain species, such as jack pine, which cannot be used to advantage in other processes, are useful in making kraft pulp, and the average value of wood used in the sulphate process, $8·10 per cord, is also low. The best quality of pulpwood goes into the manufacture of suphite at $10·18, and soda pulp at $10·07 per cord.

For the mechanical process the highest average number of pounds of pulp produced per cord of wood was 2,305 in British Columbia, and the lowest 1,818 in Nova Scotia, the average for the Dominion being 2,043 pounds per cord. By the sulphite process in the manufacture of paper the highest average, 1,137 pounds, is again found in British Columbia, and lowest, 961 pounds, in Ontario, the average for the Dominion being 1,063 pounds. The sulphate process shows highest in Ontario with 1,176 pounds and lowest in Quebec with 1,063 pounds, the average for the Dominion being 1,105 pounds. The soda process shows the lowest production, *viz.*, 930 pounds per cord.

The quantity and value of pulp used in the manufacture of paper, whether produced or purchased, includes ground wood 617,020 tons, with a cost valuation of $9,984,597; sulphite fibre, 239,129 tons, valued at $ 10,613,617; sulphate fibre, 28,822 tons, valued at $1,773,029; and soda fibre, 6,001 tons, of a value of $448,746. The value of

other materials used, such as rags, old or waste paper, alum, etc., was $ 5,797,445. The total cost of all materials used was $ 28,617,434.

The report shows a total capital investment of $ 186,787,405, of which $84,609,584 was in Quebec, $ 72,006,972 in Ontario, and $ 22,584,652 in British Columbia. Land and buildings represent an investment of $ 84,461,837, machinery of $ 59,266,596, whilst working capital was $ 15,156,506. Over 76 per cent of the total investment is in the class of combined mills, 19 per cent in mills producing pulp only, and nearly 5 per cent in mills making paper only. Each province shows an increase in capital over 1915 except Nova Scotia, where the decrease amounted to $199,030. British Columbia's capital investment rose from $ 8,344,416 in 1915 to $22,584,652 in 1917; New Brunswick from $3,927,858 to $ 7,136,277; Ontario from $ 57,173,623 to $ 72,006,972, and Quebec from $63,641,956 to $84,609,584. The average total capital invested in pulp mills was $ 1,057,610; in pulp and paper mills, $ 6,192,365; and in paper mills, $323,241. The total yearly capacity of mills making ground wood-pulp in the Dominion was 1,088,431 tons, dry weight, of which Quebec's equipment represented 601,436 tons or 55·2 per cent. Ontario represented 357,250 tons, or 32·8 per cent followed by British Columbia with 100,600 tons, or 9·2 per cent. New Brunswick with 21,145 tons, or 19 per cent and Nova Scotia with 8,000 tons or less than one per cent. The actual output of ground woodpulp in 1917 was 923,731 tons.

The quantities and values of the different kinds of paper products are shown by the following table:

	Tons.	Value.
Newsprint paper ...	689,847	$ 38,868,084
Book and writing paper ...	48,141	9,310,138
Wrapping paper ...	50,360	5,646,750
Boards	54,080	3,543,164
Other paper products ...	11,261	1,487,122
All other products (value only).		3,438,107

The average value per ton for each group was as follows: Newsprint, $ 56.35; book and writing papers, $193.40; wrapping paper, $ 112.12; boards, $ 65.50; and other paper products, $132.06.

Capital investment in pulp and paper mills for the years mentioned are summarized in the report as follows:

	1915.	1917.	Increase.
Land, buildings and fixtures	$ 74,383,608	$ 84,461,837	$ 10,078,229
Machinery and tools	31,856,265	59,266,596	27,410,331
Materials on hand, stocks in process, etc. ...	17,254,317	27,902,466	10,648,149
Cash, trading and operating accounts, etc. ...	10,242,613	15,156,506	4,913,893
Totals ...	$ 133,736,803	$ 186,787,405	$ 53,050,602

The total quantity of wood pulp exported in 1917 was 511,803 tons, of the value of $26,129,906, of which 250,043 tons, valued at $ 7,082,206 was mechanical, and 261,760 tons, valued at $ 19,110,700, was chemical pulp. There was a decided falling off in the exports of mechanical pulp, amounting to 79,709 tons, though the value shows an increase of $ 1,432,841. On the other hand, there was a marked increase in the export of chemical pulp, amounting to 32,613 tons, and a correspondingly marked increase in the value amounting to $7,415,823. More than 92.5 per cent of the quantity and 88 per cent of the value of all pulp was exported to the United States. The average value per ton for all kinds of pulp exported was $51.17 in 1917, as compared with $31.03 in 1916, and $25.48 in 1915. Mechanical pulp rose from $ 15·67 per ton in 1915 to $17.13

in 1916, and $28.32 in 1917. Chemical pulp, which was 38.36 per ton in 1915, rose to $51.04 in 1916, and $73.01 in 1917.

No pulpwood is imported into Canada.

The tatal value of paper imported increased from $2,402,557 in 1915 to $4,204,968 in 1917. The total value of paper exported in 1915 was $18,430,013, while the total value exported in 1917 was $35,774,636. That is, our imports of paper in 1917 increased in value over those of 1915 by $ 1,802,411, or by 75 per cent while our exports of paper in the same period increased by $17,344,623, or by 94.1 per cent.

To summarize in a few words the Canadian paper and pulp industry has gone up by leaps and bounds within the past four years. There were in 1917, 83 mills working; the value of their produce had increased to nearly 96½ million dollars, or by nearly 140 per cent. The consumption of wood pulp increased in the year to over 2 million cords, or nearly 50 per cent more than what it was in 1915. Exports of pulp wood rose from nearly 950,000 cords in 1915; to a little over a million cords in 1917. In 1917 the capital invested in the production of paper pulp was about 186¾ million dollars, being 40 per cent more than in 1915. This sum was made up as follows: lands, buildings and fixtures, 84½ million dollars; machinery and tools, 59¼ million dollars; materials in hand with stocks partly converted into pulp, nearly 28 million dollars; while the balance was made up of cash, trading and other accounts. Here are certainly some figures to ponder. If development is necessary, people must more largely come forward to organize and work to success industrial enterprizes of this kind.

MICA MINES IN NELLORE.*

By G. H. Tipper,

Assistant Superintendent, Geological Survey of India.

THE main formation of the country examined is a complex of garnetiferous hornblende and biotite schists, generally finely foliated. Sufficient felspar is often present to cause these rocks to resemble crushed gneisses. More massive hornblende rocks (amphibolites) are well developed in the western part of the district but they cannot be separated from the schist complex. On a large scale this complex is strikingly uniform in character but the intimate geology reveals an extraordinary variety, each band differing in texture and mineralogical composition. The following variations have been noted: epidote schists and gneisses, chlorite schists, potstones, schists with kyanite and crushed quartz bands. The general strike of the schist complex is from north to south with a prevailing westerly dip. The strike varies from place to place and swings through an angle of 90°, from north-west—south-east to north-east—south-west. Individual bands in the schist traced over any distance invariably show a wavy strike. The angle of dip is also variable but is generally high.

Rising from the almost flat plain of schist are a number of hogbacked hillocks. These hillocks form the most conspicuous feature of the landscape and are composed of lenticles of crushed and sheared quartz. West of the village of Lingampalle is a ridge consisting of a number of these quartzite lenses in which bands of the beautiful fuchsite quartzite occur. These quartzites seem to be igneous in origin and intrusive in character.

*From a report submitted to the Director, Indian Geological Survey, and published by the Government of Madras.

THE PEGMATITES.

The pegmatites in which payable mica occurs are intrusive into the schist complex. No instance has yet been seen where they are intrusive into the quartzites although there are several instances where they occur in tne mixed rock on the edges of the quartzite masses. The pegmatites are conformaable in strike and dip to the rocks into which they have been intruded and no case has yet been noted where they cut across the strike of the enclosing rocks. As might be expected from this conformability, the pegmatites show variations in strike and dip similar to those of the schists. The commonest form of these intrusive masses is that of a lens, a series of connected lenses, lenses arranged en echelon, or long irregular masses. Contrary to what is customary in other parts of India the larger masses tend to be much coarser in grain than the smaller. The central regular quartz core which is so common in the Bihar pegmatites is here often very irregularly developed. In many cases it seems that a massive development of a mixed rock of quartz and felspar takes its place. Some instances of the effects of pressure are seen but usually the crystallisation has taken place under perfectly quiescent conditions and the mica in this area has on the whole been less subject to distortion than in other areas. Many instances have been seen where the schists have been disturbed by the pegmatitic intrusion.

DISTRIBUTION OF PAYABLE MICA IN THE PEGMATITES.

The irregularities of form of the pegmatites already noted will naturally affect tbe distribution of payable mica. Unfortnnately the prevalent custom of opencasting all deposits, the lack of records of work done and the state of most of the pits in many cases prevent inferences being drawn from the workings. There are one or two points to which attention may be directed. No pegmatite contains payable mica uniformly developed throughout its mass. There is always a barren portion more or less central. The information gathered lends itself to the conclusion that the contact sections near the hanging and foot walls carry the better mica. In these huge masses, however, the contact sections may easily be of considerable thickness and it may be expected that the contact mica is irregularly distributed through this breadth. Judging from the old and present workings at Tellahodu this is the case in the hanging wall section there. Each pegmatite will vary in this respect. There will also be variations in the value of the mica content and in certain cases it may well be that no mica of marketable size will be present. Subsidiary runs of mica may also occur.

SURFACE INDICATIONS OF PEGMATITES.

The country being almost uniformly flat and soilcovered, good exposures are naturally rare. A little consideration will show that, if any portion of the pegmatite does outcrop, it will be the harder and more resistant parts only, either quartz or tbe massive quartz felspar mixture rock and in these mica cannot be immediately expected. These indications such as they are should be of the greatest value to the prospector. Even in those localities where there are no outcrops but where the presence of hidden pegmatites is suspected, the resistant portion of the pegmatite will be nearer the actual surface. The situation of many pits close to irrigation tanks is not fortuitous but is due to the prospecting work done during the excavation for the tank and the bund. The amount of mica often to be seen just below the soil-cap is astonishing. Judging from its condition and mode of occurrence this mica has been weathered out *in situ* or almost *in situ* and had not travelled any distance.

PRESENT METHODS OF PROSPECTING AND MINING.

Leaving out of account those properties which have passed into competent European management, there is one method of prospecting and mining universally in use in

the district. A number of small holes are dug in a likely place and any which give a good show of surface mica are continued, being enlarged to enable the coolies to work easily. If mica continues in the pit the work is continued, the hole being enlarged more and more until it eventually becomes a fairly large open pit from which water cannot be excluded. As the waste rock is dumped on the lip of the hole, each enlargement necessitates the re-handling of a large amount of material already raised to the surface. Each rains, the pit is flooded and partly filled with mud, causing a still further uncalled for outlay. This briefly is the history of every pit now to be seen in the district. The life of such a pit is short, depending on the value of the deposit, the stability of the walls, the depth of water level, and the presence of large waste heaps on the edge of the pit. In other words further work is stopped by the difficulty of moving large heaps of waste material or the value of the deposit does not warrant the continuance of opencasting. Throughout no attempt is made to investigate the pegmatite as a whole, to find its limits either in length or breadth. Even in places where surface outcrops show a connexion between pits no attempt is made to open them up. Labour is very wastefully used. Simple labour-saving devices are practically unknown. An important point with regard to opencasting is that, in addition to allowing free entry to surface water greatly aggravated by the spongelike dump heaps on the lip of the hole, cutting through the schist and particularly through the junction of the schist and the pegmatite opens up water channels through which water continues to percolate long after surface water has ceased. With a little intelligent forethought in preliminary prospecting and laying out the work in proper branches to allow of the proper utilisation of labour and explosives even the present system of work could be greatly improved. In the proper use of explosives the lack of efficient supervision is very apparent. The shot holes are short and badly placed, while only half a dynamite cartridge is used. The following description of. . . mine will give some idea of the final condition of a comparatively large pit after it has been opencast. The pit has been excavated to get mica from a single, well-defined pegmatite lens. The strike is north-east to south-west and the dip is practically vertical. The approximate dimensions of the pit are: length 450 feet, breadth. 200 and depth from 150 to 180 feet. At the bottom of the pit there are from 70 to 100 feet of water. The lens has been completely excavated to a depth of about 40 feet and below that chiefly on the footwall and only partly on the hanging wall. The waste rock is now heaped up on the immediate lip of the hole. It is probably the latter which has prevented the continuation of the pit. The amount of rock excavated is in the neighbourhood of 3 million cubic feet and cheap as labour is it would not pay to re-handle this mass of material. This 3 million cubic feet includes all the schist which had to be cut away to make the walls safe; this is probably 500,000 cubic feet. The amount of barren pegmatite also raised to the surface is probably one million cubic feet. The actual mica-bearing rock is thus reduced to only a million and a half cubic feet. In any other system of mining except opencasting the latter figure represents the total amount of rock which need have been raised to the surface.

The objections to opencasting may therefore be summed as follows:—

(a) it permits the free entry of surface water;

(b) it opens up the principal drainage channels in the schists and at the junction of the pegmatite and the schist;

(c) It is wasteful in labour;

(d) The disposal of the dump is a matter of considerable difficulty;

(e) *It is impossible with this system of mining to carry on operations to any depth.* Even under the most favourable conditions opencasting in this district has not produced a mine deeper than 180 feet, a mere scratch on the surface. The depth to which opencasting can be continued may be taken as equal to the breadth of the excavation. To carry on operations down to the shallow depth of 500 feet would entail a pit of at least 500 feet broad and so on in proportion. It is obviously impossible to do anything of the kind.

OPENCASTING MUST BE UNHESITATINGLY CONDEMNED.

The sole advantage of the method is that it is the simplest form of mining and can be carried on with the minimum of supervision which need not be highly trained. Most of the supervisors are very poorly paid and cannot be expected to superintend any but the most elementary work. All the work is done in the open air and a man standing on the edge of the pit can see everything that is being done.

TRENCHING FOR PROSPECTING PURPOSES.

The simplest and best way of prospecting is by means of trenches put down at right angles to the strike of the pegmatite. Trenches should be used even in places where there are outcrops, as in the majority of cases the outcrops will not show the full breadth of the pegmatite. For all practical purposes the strike may be assumed to be from nortb to south. Any difference from tbis direction will be revealed in the first trench and the others can be laid out accordingly. The trenches ought to be carried down to the fresh rock and from schist to schist across tbe strike. By this means all the necessary information as to length of strike and breadth of the pegmatite can be obtained. Such preliminary work should give valuable indications of the distribution of the payable mica in the pegmatite. The work can be done just as cheaply as by putting down a number of shallow pits. In many cases the cost will be recovered from the value of surface mica won. If the latter is spread over any considerable area it can best be won by trenching and filling in behind and not by a large open pit.

OPENING UP OLD PITS.

As neither plans nor sections of any of the old workings have ever been made, accurate information as to the extent and plan of the workings is unobtainable. Inquiries from coolies and others who at one time worked there will not elicit anything more satisfactory than a statement of the depth expressed in length of palmyra trees. The mere inspection of any old working will not enable a definite plan to be formulated although useful suggestions can often be made. Before a definite plan can be laid out for opening up it is essential that old pits and workings should be dewatered and cleaned. From what has been said above it seems that this requires a considerable outlay of capital. Pumps must be installed and some form of mechanical haulage. The old workings must be bottomed before a proper plan can be laid out. The information to be expected from this cleaning will include any signs of impoverishment of the mica content, the relative position of the workings in the pegmatite, the safety or otherwise of the workings, the possibility of utilizing the work already done in the new scheme and above all the prevention of serious disaster which might result if the old workings were neglected and were suddenly cut into.

As an instance of the capital necessary for such operations the mine referred to above may be taken. The cost of opening up and cleaning this pit cannot be put at a lower figure than Rs. 50,000 and it may be much

more. It may be pointed out that on account of the form of the pegmatite this is a more speculative venture than usual.

The reluctance of the Indian mine-owner and lessee to open up and spend money on old pits from which he himself has had a good return leads to the conclusion that this type of work will be left to European firms employing trained mining engineers, who are willing to risk their money and are able to draw up proper plans for development. The Indian miner will remain content to continue making open pits down to comparatively shallow depths from which an easy return may be expected.

Continuation in Depth of the Mica-bearing Rocks.

As all the pits are mere scratches on the surface (the deepest being only 180 feet) nothing definite is known of the behaviour of the pegmatites or of their mica content at any great depth. The marked lenticularity and irregularity of outcrop of many of the deposits lead to the conclusion that similar irregularities will occur at depth. Deposits with lenticular outcrop will be solid lenses in form. Whether these will actually pinch or merely thin and make again cannot be predicted. Even in these variations must be expected. Instances of this pinching out of lenses are well established in the Kodarma area, Bihar. The opening up of a large single lens such as the mine referred to above will be of great interest in this connexion. Large masses with long strikes may reasonably be expected to persist to some depth. In fact nothing is definitely known of the behaviour of pegmatites at any but the shallowest depths, very largely due to the wasteful methods of mining in vogue.

Opening Up New Deposits.

No hard and fast rule can be laid down for the actual opening up of new deposits. Each pegmatite has its own peculiarities and much depends on the results of the preliminary prospecting work. The actual development work of the mine is best confined to the pegmatite itself and no attempt should be made (unless in very exceptional circumstances) to do any development in the country rock. In the majority of cases the pegmatites are sufficiently strong to stand without artificial support if the work is properly laid out.

Mine Equipment at Present in Use.

Many of the pits are equipped to deal with an inflow of surface water. Oil engines and centrifugal pumps are in common use. With a fixed suction and throw, these are efficient but where, as in mining, the throw is constantly varying and lowering of pumps is necessary, they are clumsy and wasteful, involving the use of counter-shafting entailing a great loss of power. Electrically-driven pumps were installed at Sankara and were in process of installation at Kalichedu. They require skilled workmen to look after them and are not sufficiently 'fool-proof' to be recommended. The best and most efficient from all points of view are those worked by steam. The difficulty in this case is fuel. Coal is prohibitive in price and fuel obtained from the local forest coupes is poor. Possibly a solution may be obtained by adapting boilers to use oil fuel.

Mechanical haulage is by no means common. Generally waste rock is raised by hand.

Rock drills are in use at Kalichedu and Lakshminarayan mines and will be installed at Tellabodu as soon as it is possible to get them from Europe or America.

Future of the District as a Mica Producer.

The prospecting work now going on in the district points definitely to a large supply of mica still untouched. There is also a large amount still to be won from the many abandoned pits which await opening up. There does not seem to be any danger of an immediate cessation of the supply. The future of the field is, however, intimately connected

with the mining methods at present in use. If these wasteful methods are persisted in, the future of the field is a comparatively short one so far as the Indian miner is concerned, as there are no signs of his willingness to invest even a part of his returns obtained from mica in his own mines. Mica has been and still is looked upon as an easy way of getting a quick return from a very small outlay. This view is undoubtedly based on the meteoric career of the late Ansur Subba Nayudu. The Indian miner will be content to work over areas as large as he can obtain in shallow open workings. The mining future seems to remain then with the European firms who are at present at work in the field. They alone have the necessary trained staff and are willing to venture their capital in opening old pits. There are many indications that their influence is rapidly increasing in the field.

There is one way in which the Indian miners might avail themselves of an expert supervising staff and that is by co-operation. It is not every mica mine which is sufficiently valuable or big enough to warrant the whole-time services of a trained mining engineer. There could, however, be formed centralised groups of mines, each group to be placed under one man who would be responsible for the development, the expenses being shared amongst the lessees. The possibilities of co-operation do not end here but might be extended to include centralised cutting sheds and surface works. Even co-operative pumping is not out of the question.

COMMUNICATIONS.

In the Rapur taluk the mining district is very badly provided with roads. Within the triangle formed by the Rapur-Gudur, Rapur-Podalakur, and Podalakur-Gudur roads there are only unmetalled tracks. A road from the Podalakur-Nellore road at the Kondleru river crossing, was commenced. It passes the Kalichedu mines and ends in the air just north of Utukur village. It was constructed by criminal tribes some years ago and has not since been repaired. It is of course impossible to arrange roads to serve every mine but there can be little doubt that well arranged roads form one of the best means of opening up mining districts. The chief needs seem to be (1) a bridge across the Saidapuram stream on the Gudur-Rapur road, (2) a metalled road on the line of the present track past Tellabodu, Pallamane, 'L.N,' 'F' mines, across to Kalichedu joining the Rapur-Podalakur road at the Kondleru river. This would open up a line of excellent mining country and would serve the greater part of the district south of the Kondleru river, all traffic north of the river going to Nellore.

The cost of handling heavy machinery on bad roads is excessive. A steam boiler was bought at Nellore for a sum of Rs. 3,000. To get it to the mine from Gudur Railway station, a distance of twelve miles, cost Rs. 2,000 or two-thirds of the value of the boiler.

According to the *Board of Trade Journal*, a tract of 25,000 acres is to be utilised in Florida for the purpose of planting and exploiting sisal on a commercial basis. We have much lee-way to make in Mysore, despite Government's encouragement in the matter.

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The Director of Industries, Assam, reports that he has had some enquiries for tea-seed oil, and he will be glad to put sellers in communication with the buyers. Tea-seed oil is used in China for cooking purposes, and it is also used in the production of hard white soap.

CALCUTTA UNIVERSITY COMMISSION.

Summary of Recommendations.

We give below a summary of the recommendations of the Calcutta University Commission:—

Summary of the Report.

The Report of the Calcutta University Commission is an analysis and criticism not only of the university system and the schools upon which it rests, but of the social and historical conditions which give rise to them, followed by a scheme of reconstruction. Its completeness has made the Report a lengthy document; the main Report runs to five octavo volumes (each averaging about 400 pages), and is followed by eight volumes of appendices, statistics and evidence. The Report is printed in an unusually convenient and attractive form, in handy octavo volumes and in large type; and the arrangement of the work is such that the reader should be able easily to find his way to the chapters and sections in which he is most interested. The evidence is arranged subject by subject so that the reader can review without difficulty the opinions of witnesses on matters in which he is particularly interested.

The first seven chapters give the historical and social background which is essential to an understanding of the problem. The Commissioners trace the growth of the Indian educational system and discuss the great landmarks in its development: 1813, when the Directors decided to spend at least a lakh of rupees annually upon education; 1835, when Government decided to maintain an absolute neutrality in religious matters and to devote most of the funds available for educational purposes to the maintenance of schools and colleges of western learning, to be taught through the medium of English; 1854, when Government created a properly articulated system of education, from the primary school to the university, and adopted the affiliating system of university organization; 1882, when Government decided to withdraw as rapidly as possible from the direct control of secondary and collegiate institutions, except for the maintenance of a few models and, for expansion in these spheres, to trust and encourage private and local effort to the maximum extent, though on the mistaken assumption that schools and colleges wholly dependent upon the small fees which Bengal students could afford to pay would form a desirable solution of the problem; and 1904, when the Universities Act was passed. This chapter is followed by a special study of the policy of encouraging private effort in education, which has throughout been an outstanding feature of the policy of Government. Then comes a systematic and suggestive study of the psychology of the Bengali student, and of the interaction of his studies with his home life and his social traditions; an unusual contribution to an educational report, but one which should give real help in the comprehension of the problem. The special needs and difficulties of particular elements of the population (notably the Mohamedans) are then analyzed.

The School Problem in Bengal.

After laying foundations of historical and social knowledge, the Report proceeds to investigate the actual working of the secondary schools, the objects and conduct of the matriculation examination and the recognition of schools. The deficiencies of the existing system arise, in the main, from four principal causes.—

(a) Most of the high English schools are under-equipped and are conducted by an underpaid and for the most part an untrained staff.

(b) They are unduly dominated by an examination (the matriculation) which is itself ill-designed and

not of sufficiently high standard, and which gives no encouragement to many lines of study necessary for the welfare of the pupils and for the prosperity of the country.

(c) Owing to the existing division of authority between the University and the Department of Public Instruction there is no adequate machinery for supervising, guiding and assisting the work of the schools as a whole; in other words a coherent system of secondary education does not yet exist.

(d) A large and vitally important part of secondary instruction is actually conducted, not by the schools but by the colleges of the University in their intermediate classes, and, because it is so conducted it largely fails of its purpose partly because the methods chiefly employed (those of the mass-lecture) are unsuitable for work at this stage, and partly because many subjects and lines of study, especially those which have a vocational bearing, are almost wholly disregarded.

THE ARTS COLLEGES.

The next chapters of the Report deal with the arts colleges, and with the remarkable development of post-graduate work which has taken place during the last few years. The defects of the system, to which the Commissioners refer, may be briefly summarized as follows :—

(a) The numbers are too great to be efficiently dealt with by a single university organization.

(b) The undergraduate courses of instruction in arts and science are given by colleges which are almost entirely self-contained and in many cases widely scattered, and generally too meagrely staffed and equipped to be able to do justice to their students; some of them being wholly, and most of them mainly, dependent upon the fees paid by the students—a source of income wholly inadequate for the purpose. Even in Calcutta, where there are many colleges, there is no efficient co-operation.

(c) The courses of instruction are too predominantly literary in character, too little varied to suit various needs; nor is there adequate provision for training in technical subjects. At the same time, the methods of instruction are far too mechanical depending mainly on mass lectures, and giving a quite insufficient place to individual guidance and advice. This is due in part to the numbers which have to be dealt with in part to the influence of a bad tradition : but mainly to the fact the University is (in regard to undergraduate work) almost exclusively an examining body, external to the colleges.

(d) The great majority of the teachers are underpaid, and have no legal security of tenure and next to no freedom in their work, while most of them have no prospect of attaining to positions of dignity and importance such as would form a stimulus to good work.

(e) While the University has recently undertaken the direct control of almost the whole of the post-graduate work of the degrees of M.A. and M.Sc., and has brought about considerable improvement in this regard; there is, because of this division, an unhappy cleavage between the higher and

lower teaching work of the University and its colleges, which has led to some friction, and has tended to the impoverishment of undergraduate work.

(*f*) *It is impossible for the scattered* colleges in the mofussil in their present condition and with their existing resources to give to their students a training which would deserve to be described as university education. At present, moreover, these colleges suffer from lack of direct contract with the work of the University. Few of them have representatives upon the governing bodies of the University and those few only by accident. They have, therefore, no share in the respousibility for framing the courses of study which they pursue, nor can they adapt themselves to the needs of their districts.

The second volume is devoted to studies of special aspects of university work. The first chapter discusses the education of women, and gives not only a description of what is actually being done, but a demonstration of the immense local importance of this branch of work, and of the difficulties by which it is surrounded. Two lengthy chapters deal respectively with the examination system and with the medium of instruction. The former not only shows that the domination of examinations is more pronounced in Bengal than perhaps anywhere else in the world, bnt also brings out many of the problems of examination in a way that should be instructive elsewhere besides Bengal. The latter shows by an examination of evidence, that opinion in Bengal is deeply divided and greatly bewildered as to the extent to which the vernacular and English should respectively be employed in teaching. Then comes a chapter on the conditions of student life, which draws a sad picture of the circumstances in which many of the students, especially in Calcutta, have to carry on their work, and of the dangerous results which often follow from them. A short chapter on the site of the University winds up the volume.

PROFESSIONAL AND TECHNICAL TRAINING.

The third volume is mainly occupied by chapters describing the provision now made for various branches of professional and technical training, teaching, law, medicine, engineering, agriculture and technology, the general result being to show that in all these fields save law and, in a less degree, medicine, the provision now made is quite inadequate to the needs of a modern and progressive community.

ADMINISTRATIVE PROBLEMS.

The volume ends with three chapters on administtative problems. The first of these shows that the governance and administration of the University is unsatisfactory and ineffective as an instrument for the encouragement of learning. The Senate has to serve as a representative assembly and at the same time to decide matters of detail appropriate to a small executive. It is neither large enough to reflect all the shades of relevant experience and opinion, nor small enough for the discussion of intricate affairs. The Syndicate is at once insufficiently representative, and too accidental in its composition to decide, with adequate knowledge of what they involve, all the problems which the insufficiently differentiated constitution of the University assigns to its care. The relations between the University and the colleges are such that, while there is no really effective means of securing the efficiency of the colleges, yet they are under unduly rigid control which restricts their freedom of action and makes it difficult for them to show any independent initiative. The University is also loaded with administrative functions particularly in regard to

the recognition of schools, which it cannot adequately perform, and which bring it into difficult relations with the educational organization of the state. The second of these chapters deals with the position of Government in regard to education. The Commissioners urge that the relations between Government and the University are of an unsatisfactory kind, involving far too much detailed Government intervention which cannot be satisfactorily exercised and which undermines the sense of responsibility of the university authorities; while the peculiar relation between the University of Calcutta and the Imperial and provincial Governments adds an element of complexity and confusion which is not found in the other Indian universities. A section of this chapter is devoted to a discussion of the vexed question of Government service. After enumerating certain advantages in the Government service system, the Commissioners contend that these advantages are more than outweighed by grave disadvantages. The system is marked by undue rigidity; the distinctions between its grades arouse irritation and sometimes lead to unintentional injustices; it gives rise to administrative inconveniences, and from this point of view has been condemned by many leading members of the educational services themselves and by several directors of public instruction: it tends to officialize education and centralize its organization: and it embarrasses the privately managed schools, because their field of choice is restricted by so large a proportion of qualified teachers being confined to schools under Government management. A later section of the chapter deplores the practice which has been followed eversince the foundation of the Indian universities of treating university qualifications as the sole formal credentials for public employment—a practice which has been insensibly extended so that even minor clerkships are in a large degree filled in this basis. The final chapter of the volume indicates that each Indian university tends to become a water-tight compartment and that the connexion between the Indian universities and those in other lands is not as close as it should be.

The fourth and fifth volumes contain the exposition of the main structural reforms proposed by the Commission, and the arguments upon which they are based. The Commissioners point out that it is a programme which it must take years to bring to full fruition even under the most favourable circumstances, and which will require considerable financial assistance from public and private sources. Two members of the Commission, Dr. Zia-ud-din Ahmed and Dr. J. W. Gregory, add notes in which, while accepting the main features of the scheme, they suggest variation in detail, some of which are of importance.

Summary of Recommendations.

1. The recapitulation of our main recommendations set out below, is intended for convenience. The precise phrases of the following clauses must not be regarded as authoritative in themselves, but must be interpreted in the light of the fuller statement embodied in the foregoing chapters, to which references are appended in the margin. Moreover, we desire it to be understood that the recommendations set out below do not constitute the whole of our recommendations, but embody chiefly those upon which we think that immediate or early action ought to be taken. Many recommendations and suggestions, intended for the guidance of the new governing bodies of the universities, or of the proposed new authority for secondary education, are not here referred to, but will be found, with the considerations on which they are based, in the main body of the report.

Secondary Education.

2. No satisfactory reorganization of the university system of Bengal will be possible unless and until a radical reorganization of the system of secondary education, upon which

university work depends, is carried into effect. The deficiencies of the existing secondary system are radical and patent. They arise, in the main, from four principal causes. (*a*) In the first place, most of the high English schools are under-equipped and are conducted by an underpaid and for the most part an untrained staff. (*b*) In the second place, they are unduly dominated by an examination (the matriculation) which is itself ill-designed and not of sufficiently high standard, and which gives no encouragement to many lines of study necessary for the welfare of pupils and for the prosperity of the country. (*c*) In the third place, owing to the existing division of authority between the University and the department of public instruction there is no adequte machinery for supervising, guiding and assisting the work of the schools as a whole; in other words, no coherent system of secondary education yet exists. (*d*) In the fourth place, a large and vitally important part of secondary instruction is actually conducted, not by the schools, but by the colleges of the University in their intermediate classes; and, because it is so conducted, it largely fails of its purpose partly because the methods chiefly employed (those of the mass-lecture) are unsuitable for work at this stage, and partly because many subjects and lines of study, especially those which have a vocational bearing, are almost wholly disregarded.

3. A radical reform of these conditions is necessary not only for university reform but also for national progress in Bengal. The principal changes which we recommend for this purpose are as follows:—

(*i*) The stage of admission to the University should be (approximately) that of the present intermediate instead of that of the present matriculation.

(*ii*) The duty of providing training at the intermediate stage should be transferred from the universities to new institutions to be known as 'Intermediate Colleges' some of which would be attached to selected high schools, while others should be organized as distinct institutions. There should be at least one intermediate college in each district of the presidency, besides a certain number in Calcutta and Dacca; and the courses of the intermediate colleges should be so framed as to afford preparation not only for the ordinary degree courses of the University in arts and science, but also for the medical, engineering and teaching professions and for careers in agriculture, commerce and industry.

(*iii*) The intermediate colleges for men should in all cases be separate from degree colleges, and even where they are provided or managed by closely likened authorities, should be organized under a distinct educational and financial control.

(*iv*) There should be two secondary school examinations, the first, approximately corresponding to the present matriculation, to be taken at the end of the high school stage, at the normal age of 16, or, in special cases, at the age of 15, and to be known as the high school examination; the second, approximately corresponding to the present intermediate, but much more varied in its range, to be taken at the end of the intermediate college course, at the normal age of 18, and to be known as the intermediate college examination. Success in this examination should constitute the normal test of admission to university courses. The range and standards of both of these examinations should be carefully reconsidered. Detailed recommendations on these heads will be found in Chapter XXXI, paragraphs 31-70, and in Chapter XXXII.

BOARD OF SECONDARY AND INTERMEDIATE EDUCATION.

(*v*) The existing department of public instruction is not so organized as to be able to regulate and supervise the new system; more than half of the high English schools are at present entirely outside its jurisdiction. And

although the university is entitled to a large voice in their affairs, its governing bodies cannot be so organized as to be able to deal effectively with them, especially as they lack the necessary *funds*. We, therefore, recommend that there should be established a Board of Secondary and Intermediate Education, to consist of from fifteen to eighteen members, with power to appoint advisory and other committees including outside members. Among the statutory committees of the Board should be included a committee on the education of girls and a committee on madrassahs, the latter to conduct the examination of the reformed madrassah course. The Board should also have the power to constitute provincial or divisional advisory councils.

(*vi*) It should be provided that a majority of the Board should consist of non-official members, and that the Board should always include at least three representatives of Hindu and at least three of Muslim interests. Subject to these provisos, the Board should include : (*a*) salaried president, appointed by Government ; (*b*) the director of public instruction *ex-officio* : (*c*) a member elected by the non-official members of the Bengal Legislative Council ; (*d*) five representatives appointed by the University of Calcutta and two by the University of Dacca ; (*e*) from five to eight members appointed by Government among whom should be included (if not otherwise provided for) representatives of the needs of industry, commerce, agriculture, medicine and public health, secondary and intermediate education, the educational needs of girls and those of the domiciled community.

(*vii*) The powers of the Board should be : (*a*) to define the various curricula to be followed in high schools and intermediate colleges : (*b*) to conduct the two secondary school examinations described above, subject to the proviso that the universities should in each case have the power to determine what forms of the intermediate college examination they would accept, and under what conditions, as qualifying for admission to their courses in various faculties ; (*c*) to grant, after inspection, formal recognition to high schools and intermediate colleges as qualified to present candidates for the high school or the intermediate college examinations, and an adequately organized and equipped places of instruction ; (*d*) to advise Government as to the needs of these grades of education, and as to the best modes of expending the available funds for these purposes. In the opinion of the majority of the Commission it is essential for the adequate performance of the functions of the Board that it should have an inspectorial staff of its own and that it should exercise substantial executive powers, especially in regard to the distribution of grants to schools and intermediate colleges (within the limits of the allotments made for these purposes by Government in its annual budget), and in regard to the exercise of control over such high schools and intermediate colleges as may be maintained out of public funds.

(*viii*) The Board thus organized, with its president should not be wholly separated from the departmeot of public instruction, but should be regarded as an important branch or aspect of the whole system of educational organization, closely linked witb the other branches, especially through the director of public instruction. The character of the director's office would thus be materially changed. He would be relieved of much detailed work, but he would become chief of the staff and expert adviser to the member or Minister in charge of education, and would himself be in touch with all the aspects of educational work. To express this important change in the functions of the director we recommend that he should be given the position of a secretary to Government.

(*ix*) In order to give unity to the educational system by reducing the existing cleavage between Government schools and

colleges and privately managed schools, and by facilitating an interchange of teachers among these institutions, the main body of the teaching staff of the Government schools and intermediate colleges should be gradually reorganized upon a professional rather than a service basis, the fullest safeguards being taken to protect the actual or prospective rights of members of the existing services, and to ensure an adequate salary scale and reasonable security of tenure under the new system. At the same time superannuation fund for teachers should be organized to replace the existing pension system for future recruits to the profession. To this superannuation fund all aided schools should be encouraged to contribute.

(x) In view of the need of enlisting the services of a number of western-trained teachers in the reorganization of secondary and intermediate work in Bengal, a special corps of western-trained teachers should be organized the members of which should be enlisted not on uniform graded rates of pay, but on such terms and conditions as might be necessary to secure the right types of men and women in each case. Their services should be available, under the direction of the Board, either in Government institutions or in private institutions which expressed a desire for their services.

GENERAL RECOMMENDATIONS REGARDING UNIVERSITY WORK.

4. Although an effective reorganization of secondary and intermediate education would greatly improve the quality of university work, by improving the quality of the students entering the university, and by withdrawing for more appropriate treatment very large numbers of students who are unready for university methods of instruction, this would not of itself remove the grave evils which now exist; the university system of Bengal is, in our judgment, fundamentally defective in almost every aspect, and, in so far as it does good work, does it in spite of the method of organization now in vogue.

5. The defects of the system which we have analysed in detail in the earlier part of this report, affect primarily the students following courses in the faculties of arts and science, who number about eleven out of every thirteen of the total. These defects may be briefly summarised as follows:—*(a)* the numbers are too great to be efficiently dealt with by a single university organization and this will remain true even if the intermediate students (two-thirds of the whole number) are withdrawn. *(b)* The undergraduate courses of instruction in arts and science are given by colleges which are almost entirely self-contained and in many cases widely scattered, and generally too meagrely staffed and equipped to be able to do justice to their students; some of them being wholly, and most of them mainly dependent upon the fees—paid by the students—a source of income wholly inadequate for the purpose. Even in Calcutta, where there are many colleges, there is no efficient cooperation. (c) The courses of instruction are too predominantly literary in character and too little varied to suit various needs; nor is there adequate provision for training in technical subjects. At the same time, the methods of instruction are far too mechanical depending mainly upon mass lectures, and giving a quite insufficient place to individual guidance and advice, nor do they allow for variation of method to meet the needs of different students. This is due in part to the enormous numbers which have to be dealt with; in part to the influence of a bad tradition; but mainly, perhaps, to the fact that since the university is (in regard to undergraduate work) almost exclusively an examining body, external to the colleges, the colleges tend to regard themselves as mere coaching institutions and the influence of the examinations exercises an undue domination over the minds of teachers and students alike. *(d)* The great majority of the teachers are gravely underpaid, and have no legal security of tenure and next to no freedom

in their work; while most of them have no prospect of attaining to positions of dignity and importance such as would from a stimulus to good work; the result is that the profession of a college teacher has no prestige and attracts few men of the highest ability. (*e*) While the university has recently undertaken the direct control of almost the whole of the post-graduate work for the degrees of M.A. and M.Sc., and has brought about considerable improvements in this regard, there is, because of this division, an unhappy cleavage between the higher and lower teaching work of the University and its colleges which has led to some friction, and has tended to impoverishment of undergraduate work. (*f*) The system of government and administration of the university is unsatisfactory and ineffective as an instrument for the encouragement of learning; and the relations between the University on the one hand and the colleges on the other are of such a kind that, while there is no really effective means of securing the efficiency of the colleges, yet they are under an unduly rigid control which restricts their freedom of action and make it difficult for them to show any independent initiative. (*g*) The University is loaded with administrative functions, particularly in regard to the recognition of schools, which it cannot adequately perform, and which bring it into difficult relations with the educational organization of the state. (*h*) The relations between Government and the university are of an unsatisfactory kind, involving far too much detailed Government intervention which cannot be satisfactorily exercised and which undermines the sense of responsibility of the university authorities; while the peculiar relation between the University of Calcutta and the Imperial and provincial Government adds an element of complexity and confusion which is not found in the other Indian universities. (*i*) The regulations which govern the work of the University are unduly rigid and difficult to modify. (*j*) Despite consistent efforts and large expenditure during recent years, the conditions under which many of the students live are such as must be deleterious to their health, morals, and work; and there is a lack of that corporate spirit which constitutes one of the most educative factors in university life. (*k*) Finally, owing to the practice which has been followed eversince the foundation of the Indian universities of treating university qualifications as the sole formal credentials for public employment, a practice which has been insensibly extended so that even minor clerkships are in a large degree filled on this basis—too many of the students think of their university course not as a thing worth pursuing for itself or as a training for life but simply as a means of obtaining admission to careers for which in many cases no university training ought to be required.

6. One of the essential and most efficient remedies for the evils described in the foregoing paragraph is the creation of new universities wherein the teaching function can be assured of its due predominance. To this end we recommend the organization of the teaching resources which exist in the city of Calcutta in such a way as to create a real teaching university: we recommend that the project of a university at Dacca should be carried into effect at the earlier possible moment; and we also recommend the adoption of a mode of organization for the mofussil colleges which will encourage the gradual rise of new university centres by the concentration of resources for higher teaching at a few points. But before we turn to these proposals it will be convenient to set forth certain general recommendations affecting all the university organizations alike, Calcutta, Dacca, and the future or 'potential' universities of Bengal.

7. The following recommendations are applicable to all universities which may now or in the future be created in Bengal; —

(*ix*) The Governor-General and the Government of India should cease to stand in

the special relationship which they at present occupy in relation to the University of Calcutta. The Imperial Legislative Council should retain responsibility for all legislation affecting the fundamental Acts of universities; and the Governor-General should assume the office of Visitor of the Universities of Calcutta and Dacca and of any future universities which may in future be created in Begal performing (with the aid of a special organization for university work) the functions of visitation, of advice in regard to the co-ordination of effort with the universities of other provinces, of giving encouragement and assistance to research, and of affording help in the recruitment of teachers. We venture to suggest that it would be advantageous if these visitorial functions were similarly exercised over all the universities of British India.

(*xii*) The Governor of Bengal should be Chancellor of the Universities of Calcutta and Dacca, and of any future universities in Bengal, performing functions in many respects different from those now assumed by the Chancellor; these functions are more fully defined in Chapters XXXIII, XXXVII and L.

(*xiii*) The Government of Bengal should take the place of the Government of India in all ordinary dealings between the state and the universities in Bengal; though the functions of Government in this regard should be in many respects different from what they now are, and in particular, should involve much less detailed interference in academic affairs than is now the case.

(*xiv*) The regulations governing the work of the universities should be made less rigid, and should be classified in accordance with the character of their subject-matter. The classification which we recommend is as follows: (*a*) The *Act*, made and alterable only by tbe Imperial Legislative Council; (*b*) the *Statutes*, made in the first instance as a schedule to the Act (by the Imperial Legislative Council, but subsequently capable of being altered or added to by the Court of the University, subject to the approval of the Government of Bengal; (*c*) the *Ordinances*, made by the Executive Council of the University subject to ratification by the Court, the Chancellor having the right of vote; (*d*) the *Regulations*, made by appropriate bodies in the University to which such powers are entrusted by Statute or Ordinance.

(*xv*) Honours courses; distinct from the outset from pass courses, should be instituted in the universities in order to make provision for the needs of abler students; and the pass courses should be arranged in coherent groups of subjects. Facilities should be afforded for change from pass to honours courses and *vice versa*.

(*xvi*) The duration of the degree course should be three years after the intermediate stage; this provision being applied immediately in regard to honours courses, and at an early date in pass courses. In appropriate cases honours graduates should be permitted to proceed to the degree of M.A. one year after taking their degree.

(*xvii*) The titles of professor and reader should be strictly reserved for persons upon whom these titles are conferred by a university, and who are in receipt of a minimum salary, to be defined.

(*xviii*) Appointments to professorships and readerships should be made by special selection committees, including external experts; and, in order that there may be in each university a certain number of western-trained teachers of these ranks, a defined number of professorships and readerships in each university should be appointed on the nomination of selection committees acting in England, but including representatives named by the University.

(*xix*) Small Civil Service Commissions should be appointed in connexion with the Government of India and the Provincial

Government. The duties of these Commissions should be (*a*) to define the stage of educational attainment which should be required in the case of various groups of posts under Government; (*b*) to conduct competitive tests among qualified candidates for such vacancies as may be announced, under such conditions as may be defined; (*c*) to approve *all* appointments made by direct nomination in cases where this method of appointment is held to be desirable.

(*xx*) In view of the necessity for paying greater attention to the health and physical welfare of students, a director of physical training holding the rank and salary of a professor, should be appointed in each university; and a Board of Students' Welfare, including medical representatives, should be one of the standing boards or committees of each university. Responsibility for the supervision of the conditions of students' residence should be assigned to the appropriate authorities.

(*xxi*) Having regard to the comparatively backward condition of the Muslim community in regard to education, every reasonable means should be taken to encourage Muslim students, and to safeguard their interests. We have held this need always in view, and our numerous and important recommendations to this end are summarized in a special chapter.

RECOMMENDATIONS RELATING TO THE UNIVERSITY OF DACCA.

8. The establishment at Dacca of a new university of the teaching and residential type was promised by the Government of India in 1912, and an elaborate scheme for its organization has been published. Even if no such undertaking had ever been given, we should have recommended the establishment of a teaching university at Dacca, as a means of relieving the pressure on Calcutta, and of introducing, under favourable circumstances, new methods of university organization. The importance of the city of Dacca as the second town in Bengal and the centre of Eastern Bengal, as well as the number and variety of its educational institutions, render it a favourable site for an experiment of this order.

9. While we recognize the great value of the original report of the Dacca University Committee, which set before India, for the first time in a clear form, the ideal of a residential and teaching university, we think that for the sake of economy and simplicity of organization it is desirable to depart from some of the main features of the scheme embodied in the report. In particular we think that the conditions now existing, and the changes suggested in other parts of our scheme of reform (notably the system of intermediate colleges), render it desirable to depart from three features of the original scheme: (*a*) the organization of the university as a purely government institution; (*b*) the organization of the university upon a collegiate basis; and (*c*) the staffing of the university almost wholly by means of service appointments. Nor do we think it desirable that separate and distinct provision should be made for the needs of the well-to-do classes as proposed in the original report. And we have not thought it necessary to follow the Dacca University Committee in defining in detail the courses to be followed, since this seems to us to be an essential function of the new academic bodies when constituted.

10. We hold it to be of great importance that the new University at Dacca should be set on foot at the earliest possible date; and for that reason, we should advocate its establishment even if it be not found possible at once to provide all the additional equipment required. Our recommendations in regard to Dacca are as follows:—

(*xxii*) The University of Dacca should be established as a unitary teaching university, wherein all formal instruction given in the name of the university should be given by

officers of the university and under the direct control of the university authorities, no collegiate organization being interposed between these authorities and the students.

(*xxiii*) The principal authorities of the University should be:—(*a*) the Visitor (the Governor-General of India); (*b*) the Chancellor (the Governor of Bengal); (*c*) a full-time salaried Vice-Chancellor; (*d*) a widely representative Court, including *ex-officio*, elected and nominated members; the Court should have the power of making statutes, of approving the financial policy of the university, and of generally reviewing its work, and, since so large a body could not meet frequently, it should elect a Committee of Reference to represent it in dealing with the Executive Council; (*e*) a small Executive Council, with substantial powers of control over finance and the general policy of the university and with power to make Ordinance; (*f*) an academic council including the principal teachers of the university, and having large independent powers in all purely academic questions affecting courses of study, examinations and degrees; (*g*) Faculties, Boards of Studies and other statutory boards.

(*xxiv*) Government should make to the university a stated annual block-grant, leaving to the university authorities (subject to annual audit) the responsibility for expending these funds in the most economical way, and for raising, by private contribution or otherwise, such additional funds as may be necessary. An estimate of the amount required for this annual grant will be found in Chapter LI.

(*xxv*) The teaching staff of the university should ultimately be appointed by the university itself acting through selection committees which should include (in the case of the more important posts) external experts appointed by the Chancellor; a certain number of defined posts being filled after nomination by a selection committee acting in England, on which the University should be represented. This system can only gradually be brought into operation; and in the first instance it will be necessary to provide the most complete safeguards for the rights, actual and prospective, of the existing members of the educational services engaged in educational work in Bengal. For this reason the initial appointments should be made by the Government of Bengal, with the advice of the Vice-Chancellor and the director of public instruction. Minimum salaries should be defined for each class of posts; but the authorities of the University should be free to define the actual salaries to be offered in each case above this minimum. The fulfilment of the contracts of appointment should be guaranteed by Government, the guarantee being readily enforcible owing to the fact that the University will be in the main dependent upon Government grants.

(*xxvi*) The teaching work of the University should be organized in departments, each under the responsible charge of a principal teacher, who should usually be a professor, though in some minor subjects he might be a reader. The head of the department should be responsible for the general organization of the work in his subjects, including tutorial guidance. The details of the departments which seem to be necessary at the outset will be found in Chapter XXXIII.

(*xxvii*) The University should be a residential university not in the sense that all students should be required to live in halls or hostels which are under university control, but in the sense that the majority of the students will need to have such residences provided for them, that the provision and conduct of these residences will be systematically organized, under the direction of the University, and that the residential units will be utilised for the development of social life. The residences should be arranged in large units to be known as halls, each presided over by a senior member of the staff to be

known as the provost, and sub-divided into houses, each in charge of a tutor and assistant-tutors drawn from the teaching staff of the University. Room should be found for smaller residential units provided by private agency with the approval of the University; these should be known as hostels, and each should be in the charge of a warden.

(*xxviii*) In order to meet the needs of the Muslim community, which is numerically preponderant in Eastern Bengal, a special department of Islamic studies should be organized, leading up to a degree, and forming the culmination of the reformed Madrassah course, in accordance with the scheme laid down by the Dacca University Committee. In order that this branch of study may be placed on a parity with other courses, the first two years of it (corresponding to the intermediate course in arts or science) should be conducted by the Dacca Madrassah, which should for this purpose be organized on the lines of an intermediate college.

There should be a strong representation of Muslim interests upon all the governing bodies and the principal boards and committees of the University; there should also be a Muslim advisory committee; and one of the halls should be specially organized for Muslim students.

Recommendations for the Establishment of a Teaching University in Calcutta.

11. It is in our judgment essential that the teaching resources existing in the city of Calcutta should be so reorganized as to ensure that the best available teaching shall be open to all students so far as accommodation and time-table permit. It is impossible, in Calcutta, to effect this on the lines of a unitary university such as we have proposed to establish in Dacca, because the numbers to be dealt with are too large while the colleges, many of which have done valuable work during a long period, cannot be disregarded. What is needed is a new synthesis between the University in its teaching aspect, and those colleges which are sufficiently well-equipped to be capable of taking part in a system of co-operative teaching. We have considered a number of alternative schemes for the solution of this difficult problem, and while we have been unable to accept any of these in full, we have found many suggestions in them. To carry into effect the re-organization which is required a complete reconstruction of the system of university government will be necessary. It will also be necessary that the colleges should abandon the ideal of being self-contained and self-sufficient, to which the existing system has tempted them to cling, and should be prepared to co-operate with one another and with the University; that new and more effectual means should be devised for enabling the University to exercise a due control over the quality and character of the teaching given in its name, without impairing the freedom of good colleges; and that, in the system as a whole there should be a great increase of elasticity such as will enable the colleges to pay due regard to the varying needs of their students.

12. In order that the synthesis between the University and its colleges may be made effective, many changes in the present system will be necessary. (*a*) Those colleges which are to take part in a co-operative system must be more adequately staffed and equipped than these now are; and in order to make this unmistakably clear, it will be necessary to classify the colleges in such a way as to admit to the privileges of the co-operative system only those colleges which are able to make a real contribution to it. This distinction will be more fully developed later. (*b*) The colleges which are fit to take part in a co-operative system, and only these, must, as such, be directly and effectively represented upon the academic bodies of the University, which ought to consist largely of members of the teaching staffs of

such colleges. (*c*) The University thus reconstituted, ought to be in a position to ensure, more fully than is now possible, that the teaching given in its name is of adequate quality, while at the same time the colleges ought to retain control over, and responsibility for, the appointment of their own teachers. (*d*) The colleges ought to have greater freedom than they now enjoy in arranging and directing the work of their students, partly by having a larger voice in the definition of curricula, but still more by being free to determine, within defined limits, how much formal instruction, and of what kinds their students should receive; and they should enjoy this freedom in regard to pass, honours and post-graduate students. (*e*) The colleges ought to take their share in post-graduate work, and the University ought to take its share in undergraduate work; and the instruction of the best teachers in the University and in all the colleges (to which the majority of the university teachers should be attached) should be made available so far as practicable for students from all the colleges. (*f*) The University ought to be responsible for facilitating this, by arranging for the best college teachers to give lectures which will be open to all the students, and by issuing lists of such lectures; while the colleges ought to be responsible for advising their students how far they should resort to these lectures, how far to ordinary college lectures, and how far they should utilise other forms of college instruction, in small classes, *etc.* (*g*) In addition to providing lecture instruction, the colleges should be made responsible for giving individual guidance and advice to students on a far more adequate scale than is now usual, and for ensuring that their students reside in proper conditions and have reasonable opportunities for physical training and recreation and for social intercourse. In short we desire a new synthesis between the work of the University and the work of the colleges, a synthesis in which the colleges could not dominate the University nor the University dominate the colleges, as if the former were a separate organization. This would not be the case, because the University would be fully representative of all academic interests and every aspect of academic life.

13. Some colleges in Calcutta will at first be incapable of taking part in such a co-operative system as we have wrought out. For these colleges temporary provision on something like the existing basis will be necessary, until they shall have been enabled—we hope with both public and private assistance—to bring themselves up to the requisite standard. Provision will also have to be made for the needs of mofussil colleges, a problem which is separately dealt with below. But all these needs have to be kept in view in devising the new organization, and especially in dealing with critical and vitally important period of reconstruction, which will certainly cover a period of several years. Our recommendations in regard to the teaching university of Calcutta are briefly set out below; but the problem is so complex that here, even more than elsewhere, it is necessary to note that our scheme of reform can only be fully understood by reference to the chapters (especially XXXIV and XXXVII) in which it is worked out in detail. Any brief summary is liable to be misleading.

14. With these provisos, our recommendations for the organization of a teaching university in Calcutta may be summarized as follows:—

(*xxx*) The system of governance of the University should be reconstructed; and in future the authorities of the University of Calcutta should be:—

(*a*) the *Visitor* (the Governor-General of India)

(*b*) the *Chancellor* (the Governor of Bengal)

(c) A salaried full time *Vice-Chancellor* with the pay and status of a High Court Judge.

(d) A *Treasurer*

(e) A widely representative *Court*, including *ex-officio* and elected members, and a small number of nominated members. The Court under our scheme would have several hundred members, and be representative of every important educational interest in Bengal. It would (1) make statutes and ratify ordinances, (2) review the work of the university, and (3) approve the financial estimates. As a body so large could not often meet, it should elect a *Committee of Reference*, to act on behalf of the Court in sundry matters.

(f) A small *Executive Council* of seventeen members which should be responsible for the financial and administrative management of the University, and should have power to make ordinances.

(g) An *Academic Council* of eighty to one hundred members, including representatives of all constituent colleges and of all grades of teachers, which should be responsible, for regulating the teaching work of the university, and in general for purely academic questions.

(h) Faculties, Boards of Studies, Commitees on Courses, a Board of Examinations, a Board of Students' Welfare, and other standing boards and committees (including the Mofussil Board and the Board of Women's Education separately referred to below).

xxxi. The university should be organized primarily as a teaching university, consisting of incorporated and constituent colleges; the incorporated colleges being institutions owned and managed by the university itself, the constituent colleges being distinct corporations enjoying full membership of the university, fulfilling defined conditions, performing defined functions and enjoying defined privileges. The affiliating functions of the university (in regard to temporarily affiliated colleges in Calcutta, and to mofussil colleges) should be regarded as subsidiary, and of a more or less temporary order.

xxxii. The conditions of admission to the rank and privileges of a constituent college should be laid down by statute, and should define (a) the number of students such a college may admit; (b) the number of teachers to be provided in proportion to the number of students; (c) the minimum rates of pay and conditions of service to be provided by the college for its teachers; (d) the conditions to be observed by the college regarding the residence of students; (e) the minimum accommodation and equipment (including libraries and laboratories) to be provided in the subjects in which the college had recognized teachers; (f) the method of administration of the college; (g) the conditions under which teachers appointed by a college should be subsequently approved by the university, and the extent to which such approval should be required, provided always that the college should have control over appointments to its own staff. The colleges admitted to constituent rank should be named in a statute, any alteration of which require the assent of the Government of Bengal.

xxxiii. Colleges admitted to constituent rank should enjoy the following privileges:—(a) they should each be directly represented upon the academic council; (b) their students (undergraduate and post-graduate) should be entitled to attend university and inter-collegiate lectures without payment of special fees;

(*c*) their 'recognized' teachers should be eligible for appointment as university professors, readers, lecturers and examiners without leaving their colleges, and for membership of all academic bodies; (*d*) they should have full control over the discipline of their students, and (subject to general regulations) over the amonnt and type of instruction to be received by them.

xxxiv. In the proposed system of co-operative instruction the functions of the University should be (*a*) to define the curricula of studies; (*b*) to provide for the use of teachers and students libraries, laboratories and other equipment necessary to supplement those of the colleges, as well as lecture-rooms at head-quarters; (*c*) to provide *teachers especially in subjects not taught by* the colleges—teachers in subjects of college instruction, whether for undergraduate or post-graduate work, being normally provided in conjunction with a college or colleges; (*d*) to 'appoint' college teachers to give in addition to their ordinary college work *courses of instruction* (*both undergraduate* and post-graduate) which will be open to the whole University and to make payment for such courses; (*e*) to 'recognize' college teachers whose work is confined to the colleges. Once recognized, no teachers should require fresh recognition for work of the same grade even if he leaves his college. The University should define the minimum qualifications which it will normally accept for teachers working as junior assistants, or as college teachers respectively. All college teachers should be submitted for recognition immediately after their appointment by the college, and recognition should only be refused on the express ground that the candidate was not qualified for the work proposed to be allotted to him. A denial of recognition by the University should not invalidate the appointment of a college teacher; but if at any time the number of unrecognized teachers employed by a college should reach one-fourth of the total, this would be regarded as justifying a withdrawal of its privileges from the college, and the matter should be laid before the Court with a view to an amendment of the Statute conferring constituent privileges upon the college.

xxxv. In the proposed system of co-operative instruction the functions of the college should be (*a*) to direct the studies of their students, both undergraduate and post-graduate, and the courses they are to pursue, subject to any general regulations laid down by the University; (*b*) to decide what, if any, university or inter-collegiate lectures they shall individually attend; (*c*) to provide such courses of lectures, special classes, and other forms of instruction as in the judgement of the college authorities may be required by their students; (*d*) to provide for every student individual guidance and advice in his studies; (*e*) to certify to the University that every student before submitting to examination has undergone a systematic course of instruction in all his subjects, or to withhold such certificate where necessary; (*f*) to provide the necessary teaching equipment in the subjects in which it undertakes to give instruction; (*g*) to supervise the residence, health and discipline of their students. The colleges should enjoy freedom and responsibility in performing these functions, and in particular in appointing its staff. The staff of a college might under this system include teachers of three grades:—(*a*) college teachers who are also 'appointed' teachers of the University, partly paid by the University, and some of whose lectures are open to the whole University; (*b*) college teachers who are 'recognised' teachers of the University, but whose instruction (except by special arrangement) is open only to students of the college; (*c*) unrecognized teachers, who should be few in number.

xxxvi. Presidency College which has always been the principal and the best equipped centre of teaching in the University,

should continue to play this part but its resources should be so far as possible made available in the Uuiversity as a whole. *Hitherto Presidency College has represented* the principal contribution of Government to collegiate education in arts and science for men students in Calcutta. In order that Presidency College may freely play its part in the new system, along with other constituent colleges, and in order that this aspect of the financial responsibility of Government for university education may be clearly defined, the college should be recognized under the direction of a governing body appointed by Government, and including also representatives of the university and of the *college teachers. The governing body should* be allotted a stated annual block-grant at least equal to the total present expenditure on the college, and should (subject to annual audit) be free to expend this revenue together with any other sources of revenue which might accrue from fees, subscriptions or endowments, at its discretion. It should (subject to the fullest safeguards for the existing and prospective rights of members of the educational services) be free to make appointments to vacancies in the teaching staff without reference to service rules, under such conditions as *might be defined by* Government at the time of transfer, and in accordance with the regulations of the university; but at least ten chairs, to be held by teachers of the college, to be known as presidency chairs, and to carry all the dignity and privileges of professorships in the university, should be reserved for western-trained scholars, and should be filled after nomination by a selection committee acting in England; part of the instruction offered by the holders of these chairs being open to the whole university.

xxxvii. Appointments to professorships, readerships and lectureships in the university should, in every case, be made with the aid of a specially appointed committee of selection, which should, in the case of professorships and readerships, include three external experts nominated by the Chancellor. In all cases in which a professorship *or readership is associated with a practicular* college, or in which the college provides a part or the whole of the emoluments of the post the college should be represented on the committee of selection, and should have the power to veto any particular appointment. With this exception all appointments to teaching posts in a constituent college should be in the hands of college, the university reserving the power to give or withhold recognition.

xxxviii. Colleges which are unable to fulfil the conditions laid down for admission to constituent rank , but whose continued maintenance is necessary for the accommodation of students, should be granted, on defined conditions, the privileges of temporary affiliation for a period of five years, in order to give them an opportunity of satisfying the conditions for constituent rank. Such colleges should not be directly represented upon the governing bodies of the university; their students should not be eligible to attend lectures given by university teachers or approved teachers in the constituent colleges, except by special arrangements and on *payment of a fee*; their teachers should not, as such, be eligible as members of university bodies, or be recognized as university teachers, or be appointed as examiners. The affairs of colleges in this group should be controlled by a special committee reporting to the executive council, on which the colleges should not be represented, though they would have a right to be heard.

xxxix. It is necessary to afford financial assistance to colleges in order to enable them to fulfil the condition of admission to constituent rank. It is also necessary to *establish at an early* date new arts colleges, notably an Islamia college for Muslim students, to which university chairs or readerships in Arabic, Persian and Islamic history should be attached and an orthodox

Hindu College, based upon the degree department of the Sanskrit College, to which university chairs or readerships in Sanskrit and Pali should be attached.

xl. All colleges should be inspected at intervals of not more than three years, and a single general inspection report should be circulated.

*x*li. All applications to Government for additional assistance made by or on behalf of the university itself or any of its colleges, whether incorporated, constituent or temporarily affiliated, should normally be forwarded through the executive council (or commission) at a fixed time of year, and the executive council in forwarding them should be empowered to append its own comments and recommendations.

xlii. In view of the great difficulties attending a simultaneous transplantation of institutions so numerous as those connected with Calcutta University, and the certainty that unless all were transplanted, the co-operative system of teaching would be rendered impracticable, and in view of the impossibility of leaving city of the size of Calcutta, without university organization at its centre, we consider that the attractive proposal to remove the University to a rural or suburban site must be abandoned. The centre of the teaching and administrative work of the University should continue to be in the College Square area, where the administartive and teaching centres of the colleges should also be as far as possible concentrated. But land should be acquired in the suburbs for residential purposes and for playing fields; and the whole problem of the sites of educational buildings in Calcutta and its district should be carefully planned and worked out in connection with the Calcutta Improvement Trust and the Corporation.

xliii. In order to safeguard the interests of the Muslim community, there should be representatives of Muslim interests upon the principal governing bodies, boards and committees in the University; the particulars of this representation will be found in Chapter XXXVII. We also recommend the establishment of a Muslim advisory board with power to address any constituted body of the Univsrsity upon any question affecting the interest of Muslim students.

xliv. For the determination of any dispute between any college or university teacher and the appointing authority regarding the fulfilment of the teachers contract on appointment, the University should appoint a tribunal, by whose decision both parties should be bound to abide.

xiv. Any college or community or group of teachers who feel themselves aggrieved should have a right of appeal to the Chancellor, who should have power to apoint a small impartial commission of enquiry.

xlvi. The scheme of reorganization defined in the foregoing clauses involves far reaching and complex changes. The new governing bodies proposed to be establisbed cannot be immediately organized nntil the classification of colleges is determined, and until the rearrangements necessitated by the system of intermediate colleges have been carried into effect. It is, therefore, essential that during the period of reconstruction there should be a small executive commission with exceptional powers. The arrangements which will be necessary during the period of reconstruction will be further discussed at the end of this chapter.

RECOMMENDATIONS REGARDING MOFUSSIL COLLEGES.

15. The problem of dealing with the scattered colleges in the mofussil is a very difficult one. It is impossible for them in their present condition and with their existing resources, to give to their students a training which would deserve to be described as university education. At present, moreover, these colleges suffer from lack of direct contact with the work of the University. Few of them have representatives npon the governing bodies of University, and those few

only by accident. They have, therefore, no share in the responsibility for framing the courses of study which they pursue, nor can they adapt themselves to the needs of their districts. These colleges will be deeply affected by the main features of our proposals; on the one hand by the manifestly superior training which will be obtainable when strong teaching universities are established in Calcutta and Dacca: on the other hand by the withdrawal of all the intermediate students on whose fees their existence largely depends. It would be excessively costly and indeed impossible, to bring them all up to such point of efficiency in respect of staff and equipment as would turn them into true university centres. On the other hand, it would be a disaster if, on these reasons, the whole body of mofussil degree students were drawn into Calcutta and Dacca.

16. We are satisfied that some form of special treatment is necessary for the mofussil colleges. We have discarded one proposal having this end in view—the proposal that a new University of Bengal should be forthwith established. We believe that the best solution will ultimately be that by a judicious concentration of resources a few of these colleges should be encouraged and helped gradually to develop into more highly organized and semi-independent institutions and ultimately, perhaps, into distinct universities; while others should become intermediate colleges. But we think that this change should not be unduly forced, and that some form of organization ought to be created which, while rendering possible the development that seems to us most desirable, would not exclude other possible solutions.

17. Our recommendations in regard to mofussil colleges, which are more fully set forth and argued in Chapters XXXV and XXXII, are as follows:—

(xlvii) The mofussil colleges should, for the present, remain in association with the University of Calcutta and the direction of their affairs should be entrusted to a special Board of Mofussil Colleges, upon which every mofussil college teaching up to the degree level should be represented, while, in order to ensure equivalence of standards, there should be a substantial representation of the teaching university, and the Academic Council should be consulted upon all proposals affecting degree courses.

(xlviii) In order to encourage the growth of the stronger colleges which may be capable of becoming potential universities such colleges should on fulfilling certain defined conditions, receive the title and rank of 'University Colleges,' and should then be specially represented upon a special panel of the Board, and empowered, with the assent of special panel and of the Academic Council, to exercise a certain degree of autonomy in the framing of their courses and the conduct of their examinations.

(xlix) Additional funds will be necessary for the development of the university colleges. Such funds as may be available for this purpose should be expended by Government after report from the Executive Councils (or Commission) of the University. All applications for additional assistance made to Government by or on behalf of mofussil colleges should be forwarded through the Executive Council (or Commission), which should, in forwarding them, be empowered to make its own recommendations and suggestions, and might ask for a report from the Board of Mofussil Colleges.

RECOMMENDATIONS REGARDING THE EDUCATION OF WOMEN.

18. We have been deeply impressed by the very great importance of encouraging a more rapid development of women's education in Bengal by the social difficulties with which this problem is surrounded, and by the extremely slight progress which has hitherto been made. But we are of opinion that, owing to the directness with which it touches deep social issues, this problem ought to be dealt with by bodies, especially

conversant with the needs and interests involved.

19. Our recommendations regarding the education of women and girls are as follows:—

(*i*) There should be standing committee of the Board of Secondary and Intermediate Education to deal with the education of girls, such committee to include women and to be empowered to consult bodies consisting of women only, in which *purdah* women could take part.

(*ii*) An attempt should be made to organize *purdah* schools for Hindu and Muslim girls whose parents are willing to extend their education to fifteen or sixteen.

(*iii*) In view of the small number of women candidates for university courses the intermediate classes should not be separated from the degree colleges for women.

(*iiii*) We realise that an increasing number of women students will require the most advanced teaching that the university can provide. We hold, therefore, as a matter of principle, that women should be admitted as far as possible to the instruction provided or organized by the university. But we recognize that in the special circumstances existing in Bengal, the main provision for women's higher education must be made in distinct institutions and under special direction.

(*iiv*) A special Board of Women's Education should be established in Calcutta University and should be empowered to propose special courses of study more particularly suited for women, and to organize co-operative arrangements for teaching in the women's colleges, more particularly for the medical courses.

(*iv*) Relations should be established between this Board and the Governing Body of the Lady Hardinge Medical College for Women at Delhi.

Recommendations Regarding the Government Educational Services.

20. In exploring the condition of secondary and university education in Bengal our attention has necessarily been much engaged by the working of the educational services. We have found that the service system had in the past a great deal to recommend it, notably the security of its tenure, the comparative adequacy of the salaries which it offered, the prestige which attached to it, and the convenience which it often displayed in enabling the exiguous available teaching force to be used at the points where it was most needed. We have found, also, that the system has attracted many able and devoted men to the service of education, and has obtained a very strong hold over the minds of Indian teachers, who in a multitude of cases prefer work under service conditions to any kind of teaching work. But our survey has convinced us that the disadvantage of a service organized on the existing basis go far under present conditions to outweigh its advantages. The system is in some respects marked by undue rigidity. The distinctions between its grades arouse irritation, and sometimes lead to unintentional injustice. It makes a sharp and in many ways unfortunate cleavage between those who are employed in Government schools and colleges, and the much larger and rapidly increasing number of teachers who are engaged in private schools and colleges. It gives rise to administrative inconveniences and from this point of view has been condemned by many leading members of the educational services themselves, and by several directors of public instruction. We have been convinced that the time is at hand when the service system of recruitment for educational work should be gradually abandoned, or be so transformed in character that the continued use of the term 'services' would be misleading; and that the organization of teaching work should be on a professional basis rather than on a service basis. But

this should be done by gradual stages and with every possible safeguard of the rights, present and prospective, of existing members of the services in all grades. The general character of our recommendations will already be apparent from earlier paragraphs, and notably from the recommendations numbered (*ix*), (*x*), (*xxvi*), and (*xxxvii*) above; they are also analyzed in Chapter L of this report. But it may be convenient here to summarize these changes in a single view, on the ground of the importance of the departure which we propose should be gradually made.

(*lvi*) In regard to the secondary and higher secondary branches of education we think that the ultimate establishment of a professional organization of the main teaching body in all schools under the direction of the board should be aimed at from the outset; teachers being free to transfer their services from private to Government schools or *vice versa*, and being all participants in a general system of superannuation, managed by the board. We recommend that resonable conditions as to the salary and tenure of all teachers should be exacted by the board from all schools under its jurisdiction.

lvii. In view of the need of western-trained teachers in these grades of education, we have recommended the recruitment of a special corps of teachers, who would be employed and paid by Government (through the board) and would enjoy full security and pension rights. This 'corps' may be regarded as a modified service, but with two differences: (*a*) that there would be no fixed or invariable hierarchy of grades, and (*b*) that the work of the teachers so employed would not be limited to Government institutions.

lviii. For university work we consider the service system to be unsuitable, especially in its present form; and we have recommended that in the new university of Dacca, in Presidency College and in other Government colleges engaged in university work appointments should in future be made not by the Secretary of State or by the local Government but by the governing bodies of the universities and colleges concerned. At the same time we have suggested safeguards against abuse (*a*) by providing for a special form of selection committee; (*b*) by providing that in the case of certain listed posts which it is desirable to fill with western-trained scholars of distinctions, nominations, should be made by special selection committees in England, which the University and the college (where a college is affected) would be represented; and (*c*) by the recommendation that Government should guarantee the salary and pensions or superanuation allowances attached to these posts.

lix. Our recommendations in this regard do not apply to the administrative educational services.

The Comparative Advantages of a Government Service of Teachers and of an Organized Teaching Profession.

21. In view of the great importance of the issues which are involved in this question, it will be convenient that we should here state more fully the chief reasons which lead the majority of us to regard a professional rather then a service organization of teachers on the whole and ultimately, the better adapted to the needs of a comprehensive system of education.

22. The teaching profession is not one of those which can be allowed to rely solely on fees paid by the public for professional services. Under such an arrangement sound education cannot be rendered accessible to all at a sufficiently low fee; still less could it be made gratuitous at any of its stages. The action, in some form or other, of the State is indispensable. The State, for the common good, must subsidise the work of teaching. This necessarily raises the question what kind and degree of control over the teachers the granting of State subsidies

should involve. Should this control be exerted directly or indirectly, *i.e.*, by subsidising a profession or by making teachers members of the Government service, or by both methods concurrently?

23. Government service for the teaching profession has many administrative advantages. It provides cadres of appointment, well-defined increments of salary, a pension system, rule of leave, a convenient subordination of ranks, and opportunities for disciplinary control. By some, the status of Government employment is highly valued, perhaps by more the security of tenure which such service generally implies.

24. On the other hand a teacher's duties are only in a minor degree administrative. For this reason the methods of transfer and of promotion which in the administrative services on the whole work well are much less well adjusted to the needs of colleges and schools. In an administrative service, length of official experience is such an important factor in each individual officer's efficiency that the advantages of promotion by seniority generally outweigh its disadvantages, provided that the rule is elastic enough to allow for making occasional exceptions. In teaching, on the other hand, length of experience is as a rule much less important relatively than personal characteristics and individual gift. For this reason to select a candidate from a number of applicants in view of his special fitness for a particular post in a particular school is in this case naturally a more suitable method of appointment than is promotion by seniority in a cadre of a grade service. In an administrative service the head of a department, though he may be at a distance, can usually judge with comparative certainty whether the transfer of an officer from one post to another will be advantageous to the service as a whole. But in the case of the transfer of a teacher, it is the domestic conditions and internal efficiency of each of the two institutions concerned which have principally to be borne in mind. And of such matters no authority at a distance can feel with confidence that it is fully informed.

25. In the second place, Government service for teachers, if organized upon a basis which covers the whole of a country, conflicts with what should be the responsible freedom of local authorities and of the governing bodies of endowed schools (if the latter are brought within the scope of the system) in making appointments to the staffs of the schools under their care. The system tends to officialize education and to centralise its organization. But every good school should desire to cultivate special characteristics and to preserve the good traditions of its corporate life. Such distinctiveness and individuality among schools must increase in proportion to the degree in which the school system adapts itself to the varied preference of the people which it serves. These characteristic differences, between schools call for a method of appointment which allows the members of the appointing body which has intimate knowledge of the needs of the institution concerned to select (subject to conditions laid down by public authority with regard to professional qualifications) the applicant whom they deem to be the best adapted to the circumstances of the particular school.

26. In the third place, privately managed schools, however efficient, are put to disadvantage by the system, because their field of choice is restricted by so large a proportion of qualified teachers being confined to schools under Government management. Government service for teachers, unless it covers the whole field of education, tends to divide the body of teachers into two groups those in Government schools and those in privately managed schools. Such a division entails some risk to the unity of national education. It is possible to allow on approved conditions selected privately managed institutions to avail themselves, whether at the expense of Government or at their own

xpense, of teachers who have been appointed nd are paid by Government. But many ifficulties are inherent in such an arrangement, except when (as is the case in one of ur own recommendations) the plan is introuced on a subsidiary scale.

27. In the fourth place, as teaching is an rt rather than a business, and as the highest unctions of a teacher are scholarly and astoral rather than administrative, the onditions of employment best adapted to uch a calling are those which allow the reatest freedom to individual initiative and elf-expression. These conditions are found n a professional organization rather than n a service directly administered by Govrnment. But education is so closely implicated with public interests as well as vith private conviction that the community, r the Government acting in its behalf, annot dispense with the right of exercising upervision over the qualifications which ach entrant into the profession should be equired to possess. We believe, therefore, hat the whole body of teachers should *ultimately* be organized by charter as a rofession, with a registration council representing the various bodies and grades f teachers and, in India both Hindu nd Muslim teachers) to regulate the conlitions of entrance, to grant admission, and o frame and enforce rules of professional onduct. In view of the public interests nvolved, the sanction of Government should e required to the conditions proposed for dmission to the profession and to any tatutes or regulations of major importance which the registration council might think xpedient to adopt.

28. We conceive that, under such a form f organization, professional *esprit de corps* vould be combined with an effective degree f public control; that the unity of national ducation would be promoted, with due regard to the different qualifications required or service in its various grades; that rimary, secondary, technical and university education would each gain by having its representatives upon a council common to the whole profession and discussing its affairs; that the study of the science and art of education would be promoted by the enforcement of such study as a condition of admission to the profession; and that the teachers' calling as a whole would acquire greater dignity and public consideration and thus become more attractive to men and women of ability and promise.

Recommendations Regarding the Training of Teachers.

29. A serious deficiency in the numbers of well-qualified teachers is the fundamental weakness in the system of secondary and intermediate education. It is also the cause of an enormous waste of money and of time. There is urgent need in Bengal for many thousands of well-trained teachers, equipped with a sound knowledge of what they have to teach and with a clear comprehension of the aims and methods of a good school. In particular, the methods of class teaching are at fault; and the corporate life of the schools is inadequately developed for the formation of character. If the teaching were improved the school life of the average high school boy could be shortened by two years.* The amount which parents in Bengal would save by this economy alone would be not less than 15 lakhs of rupees a year, a sum which would be substantial contribution towards the cost of the reform of secondary and intermediate education in the Presidency. In addition to this, improved methods of class teaching in the schools would enable parents to avoid in almost every case the cost of providing private tuition for their sons. The amount of this saving we cannot estimate, but it would be very large. And these economies would accompany an actual advance in the attainments of the boys and a material improvement in their mental vigour and physique.

* The average of candidates for matriculation is now nearly 18½ years. With better teaching it should be 16½ years or lower.

The systematic reform of secondary and intermediate education in Bengal will be greatly reduced by these savings on school fees and on private tuition, apart altogether from the intellectual and physical advantage which it would incidentally secure. One indispensable condition of this reform (another aspect of which is a material improvement in the pay and prospects of the teaching profession) is the better professional training of teachers. In this work the Government and the universities should co-operate.

30. The recommendations which we put forward with a view to meeting these requirements are as follows :—

lx. Seven hundred trained teachers should be sent annually into the secondary and higher secondary institutions. Many of these would be employed in the intermediate colleges. The Universities of Calcutta and Dacca should each furnish annually 100 trained graduate teachers. The remaining five hundred should, after passing the intermediate examination, be trained in training colleges established by Government.

lxi. At each of the two universities there should be a department of education under a professor of education assisted by an adequate staff. Under the direction of the professor there should be a training college, to which should be attached a large practising school and also a small demonstration school; the first to accustom the students in training to the methods which should be used in every good school under normal conditions of work; the second to provide opportunity for educational experiments and for the trial of new methods and courses of instruction. The course of training should in all cases include a prolonged course of practice in teaching. One of the principal aims of these university departments should be to train teachers in the methods of teaching languages (especially English and the mother tongue) and science. They should also (in association with other departments of the university) be the centres of investigation in educational subjects and for the training of advanced students in the principles and history of education.

lxii. Education should be included as a subject (*a*) in one of the courses of study at intermediate colleges, and (*b*) in some of the groups approved for the pass B. A. degree. The professor of education should be held generally responsible for the origination of study in education in the pass degree course and also in the house for the degree of bachelor of teaching. The latter should usually be taken as a second degree, after a course of training extending over one year subsequent to the B. A. or B. Sc. But students who have taken the intermediate courses (including education as one subject) and have subsequently served for two years on the staff of a recognized school should be allowed to proceed direct to the B. T. degree after taking an approved course of instruction, extending over three years, partly in the university departments of arts or science, partly at a training college. For these and other students taking the professional courses for teachers bursaries should be provided on a liberal scale.

lxiii. Any student who has taken the B.T. degree should be allowed to present himself for the examination for the M. A. after a course of instruction extending over two years. The principles and the history of education should be added to the list of subjects in which a candidate may present him self for the M. A. degree.

lxiv. The departments of education in the Universities of Calcutta and Dacca, should arrange courses of public lectures on educational subjects in these cities and at other centres in Bengal.

Recommendations Regarding Oriental Studies.

31. The systematic development and encouragement of oriental studies is one of the most natural and important fuctions of

an oriental university. But this function has hitherto not been performed in a satisfactory way, partly because the primary function of university work has always hitherto been held to be the development of western learning, and partly because there has been a dislocation of aim between the studies carried on in the university and its colleges, theoretically in accord with western methods, and the traditional studies in the oriental classical tongues which are carried on in the *tols* (for Sanskrit) and in the madrassahs (for Islamic subjects). The history of these organizations and their relations with the system of western training form a very complex and difficult subject, which is fully investigated in Chapter XVI. In the result, while in the Sanskrit College and the *tols*, and (until recently) in the Madrassahs, the purely traditional learning was pursued, the attempts made in the University and its colleges to apply western methods to the study of these subjects has been un-satisfactory. A very substantial advance has been made in the last few years in the higher branches of these subjects (especially Sanskrit and early Indian history); but the work of the colleges, and the training given to the mass of students, still remains far from satisfactory.

32. At the same time in spite of the emphasis laid by Government eversince the time of Macaulay upon the importance of serious study and systematic development of the vernaculars, the study of the mother tongue has been gravely neglected alike in the schools, in the colleges, and in the University; the demand of vernacular knowledge made upon the students being of the most inadequate and perfunctory character. The results of this have been unhappy, since it has involved a neglect of any proper development of the student's natural medium of thought.

33. We consider it to be important (*a*) that the purely oriental and traditional studies should continue to be pursued in the Sanskrit College and the Madrassah, but that neither these studies, as traditionally pursued, nor the University, would profit by any attempt to bring them under direct university control; they ought to remain distinctly organized; (*b*) that the development both of the oriental classics and of the vernaculars should receive more systematic attention than has hitherto been given to them and that for this purpose university students ought to have access to the learning of the distinguished *pandits* of the Sanskrit College and *maulvis* of the Madrassah, in so far as these are ready and able to help them. Some arrangement is therefore necessary whereby the centres of traditional oriental studies, while remaining distinct and undisturbed, should yet be brought into relation with the universities, while at the same time oriental studies on more modern lines are also cultivated in the universities. An arrangement of this kind seems to be practicable, though, owing to existing differences of organization, there would have to be some variation of treatment in regard to Sanskritic studies on the one hand, and Islamic studies on the other.

34. Our recommendations for dealing with this difficult problem are as follows:—

lxv. The Sanskrit College, Calcutta, should be reorganized in three sections (*a*) a high school and intermediate college which would take over the work of the present intermediate classes, as well as the 'high' classes of the high school course, but would throughout lay special emphasis upon Sanskrit; (*b*) a constituent college of the teaching University, arranged to accommodate, say, 500 students; to this college should be attached the university chair of Sanskrit and the chair or readership in Pali, and its students should profit by the instruction of the *pandits* in the neighbouring *tol* department; this college would naturally be the principal centre of teaching in an honours school of Sanskrit; (*c*) a *tol* department which would work, as now, in connexion

with the Sanskrit Association and have no direct connexion with the University. These three institutions should be housed in separate buildings side by side, on the site of the existing Sanskrit College and the Hindu School; the library should be available for the use of all three. They should have distinct governing bodies, which would be in relation, respectively, with the board of secondary and intermediate education, with the University and with the Sanskrit Association; but care should be taken to ensure that there were common elements in all three governing bodies.

lxvi. Students of the *tol* department of the Sanskrit College, if they pass the title examination, and are adequately qualified in English, should be encouraged to pursue their studies in western aspects of their subjects without going through the high school and intermediate course; and for this purpose the University should institute a diploma, or possibly a degree, for such students, the course of study for which should include such subjects as comparative philology and archæology.

lxvii. In regard to higher Islamic studies, we have already recommended that a department of Islamic studies giving in the first instance degree of B. I. should be organized in the university of Dacca on the lines defined by the original Dacca University committee, as the culmination of the reformed madrassah course, and that the first two years of the proposed course should be conducted in the Dacca Madrassah, and possibly also in one or two other madrassahs; we have further suggested that an alternative or modified course (including elmentary science, and more nearly approximating to the proposed courses of the intermediate colleges, while still retaining essential Islamic studies), might be gradually introduced in these madrassahs, and might lead up to a degree of B. A. Islamic studies, treated on modern lines.

lxviii. The Anglo-Persian department of the Calcutta Madrassah should be organized as a distinct high school and intermediate college.

lxix. In Calcutta we have recommended the establishment of an Islamia college as a constituent college of the teaching university; to this college chairs or readerships of Arabic, Persian and Islamic history should be attached and it should become the chief centre of instruction for an honours course in Arabic and Persian. For the purposes of this work, the co-operation of eminent *maulvis* from the Calcutta Madrassah should be invited and course given by them either in the Madrassah or in the Islamia college should be recognized by the university for these purposes.

lxx. Students following the traditional course in Calcutta should be encouraged, without leaving the madrassah, to take up, after passing the senior madrassah examination special courses for a diploma, or possibly a degree, instituted by the university. Part of the instruction for this might be given in the Islamia college.

lxxi. With a view to encouraging a more serious and scientific study of the vernaculars, chairs or readerships in Bengali, Urdu and other vernaculars should be established in the University; and the literature and philology of the vernaculars should be introduced among the subjects which students are permitted to offer both for pass and for honours degrees.

RECOMMENDATIONS REGARDING PROFESSIONAL AND VOCATIONAL TRAINING.

35. We have been deeply impressed by the general disregard among university students in Bengal of the possibility of finding careers in practical—professional and technical—work other than law and (to a less extent) medicine; by the deficiency of opportunities for obtaining training for such careers, and by the consequent overcrowding courses of purely literary study. This

disregard has its roots in historical and social facts which especially affect the classes from which the bulk of the students are drawn. But it must be amended; and any scheme of educational reform which does not place in the forefront need for such an amendment must fall short of the country's needs.

36. The strong hold which the university and its courses possess upon the minds of the educated classes in Bengal has led to the suggestion that if only the university offers degree courses and examinations in practical and technical subjects the prejudice against careers of this type will be overcome. There is something to be said for this view, and undoubtedly action ought to be taken by the universities, and will have a useful influence upon opinion. But in this sphere even more than in others, it is training above all which is needed and as training is costly and demands elaborate equipment in nearly all vocational subjects, no course of study should be defined until there is a responsible assurance that the necessary provision of teaching and equipment is forthcoming. And unfortunate results may follow, and the whole movement towards practical careers suffer a check, if men are turned out in large numbers with an equipment of a kind for which there is very little demand. There is real danger in the idea that, if an examination is provided and a degree course defined, all that is necessary is done.

37. But the provision of courses of study by the University, even on the most adequate scale, is not enough. Degree courses in technical and professional subjects other than those for the established profession of medicine and law, are required by a comparatively restricted number of persons even in highly industrialized countries. The highly trained scientific experts whom the industries of a country can absorb—and it is only with the training of such that a university should be concerned—must always be relatively few in numbers. On the other hand, industry, especially in a country where it is just entering upon a period of expansion, needs a very large number of men who are intelligent and educated, and whose training has given them some introduction to the sciences at the base of their calling, but who cannot be called scientific experts. The need for such men is probably the greatest need of to-day in Bengal: though the others also are needed. And from this point of view the system of intermediate colleges with their varied course—each with some vocational bias, though still general in character—must be of very great value. They will be of value also in providing students with a more efficient preliminary training, not only for technical courses of study, but also for the old professional courses. They represent, in short, the essential foundation of a new and sounder system of training.

LAW.

38. The system of training in law is of recent institution, and seems to be working well. Nor can it be said that there is such a paucity of lawyers in Bengal as to make it urgent that measures should be taken to increase the supply. In this field, therefore, we have few changes to suggest.

lxxii. In order to ensure a more adequate treatment of the more purely academic branches of legal studies, the Tagore Chair of Law (hitherto devoted to special lectures) should be used to secure the services of a permanent professor in jurisprudence or Roman law; and it would be desirable that other full-time chairs or lectureships should be established if funds become available.

lxxiii. The course for the degree of B. L. should remain a post-graduate course extending over three years. Students should be permitted, during the course of study for a degree in law simultaneously to undertake a course in another faculty. But special care should be taken to exact the full measure of work in both faculties.

lxxiv. The existing law college at Dacca should be developed into a distinct faculty of law organized as a department of the Dacca University. The faculty should include at least one High Court judge together with representatives of other branches of the profession and in order to enable these members to be present at its meetings, it should be empowered to meet, when necessary, in Calcutta.

MEDICINE.

39. The system of medical training provides for two classes of students, those who aim at a university degree, and who are provided for in two colleges, one Government and one private, (both in Calcutta) and those who aim only at the licence granted by the state Medical Faculty of Bengal, and are given a shorter and less elaborate course in institutions attached to hospitals at Calcutta and Dacca and known as medical schools. The demand for admission to the medical colleges and the degree courses is greater than the accommodation. On the other hand, the existing need in Bengal is greatest for medical men who will be willing to practise in the rural districts, which experience show, that graduates are reluctant to do. The provision made for medical training in the Calcutta Medical College seems to us to be sound, though hampered by various difficulties and by the lack of organized teaching in various special subjects. The medical schools also (which are wholly unconnected with the University) are doing useful work, but the course is rather a slight one in some respects, and the gap between the two branches of the profession is too great. We do not, however, suggest any immediate changes in this regard. Our recommendations regarding medical training (in so far as it is affected by our general proposals) are as follows :—

lxxv. The Calcutta Medical College and also (if it is able to fulfil the conditions) the Belgachia Medical College, should become constituent colleges of the Teaching University.

lxxvi. The standard of entrance to the Medical Faculty, as to other Faculties should in future be that of the proposed intermediate college examination, one form of which should be adapted to the needs of medical students, though entrance should not be restricted to students who have taken the examination in this form.

lxxvii. Training in the preliminary sciences (physics, chemistry, botony and zoology) should be provided as soon as possible elsewhere than in the medical colleges. It may be found possible to afford a sufficient training in selected intermediate colleges. But this could not meet the whole need, and provision should be made in these subjects by the University of Calcutta and its constituent colleges.

lxxviii. Preliminary scientific training for women medical students should be made, if possible, by co-operation among the women's arts colleges, and the scheme of training should hold in view the requirements of the Lady Hardinge Medical College for Women at Delhi, as well as those of the Calcutta University.

lxxix. The principal of the Calcutta Medical College should be paid a salary sufficient to exempt him from the necessity of undertaking private practice.

lxxx. A well equipped department of public health should be established in the Calcutta Medical College. Professorships should be created in this college in (*a*) pharmacology, (*b*) mental diseases, (*c*) dermatology, and syphilology, (*d*) diseases of the ear, nose and throat; and lectureships in (*e*) X-rays and (*f*) electro-therapy. There should also be a chair of the history of medicine; this might be a chair in the University.

lxxxi. In view of the absence of organized and systematic training in dentistry, it is desirable that a department or school of

dentistry should be established as soon as possible in the Bengal College of Medicine.

lxxxii. A medical college at Dacca, preparing students for degrees in medicine, should be established in due course when adequate arrangements can be made.

lxxxiii. A much needed expansion of medical training of the type given in the medical schools would be facilitated by the use of some of the intermediate colleges to provide the necessary training in the preliminary sciences.

ENGINEERING.

40. The training of skilled engineers is one of the most important services which the universities have to render in an industrial society; and in view of the coming development of Indian industries it is to-day more important than ever. The Civil Engineering College, Sibpur, has hitherto devoted itself mainly to the production of civil engineers; but if industrial development proceeds apace, there is likely to be a large and growing demand for mechanical engineers. One of the chief obstacles in the way of this work has hitherto been the aversion of students of the *bhadralok* classes from any avocation involving manual work; and in this sphere the Engineering College has, in fact, hitherto confined itself to training men for subordinate branches of the profession, and has made no attempt to provide training of a university level. During sixty years the Engineering College has done good work in difficult circumstances; but in the judgment of the Indian Industrial Commission, as in our own, the time has come for a reconsideration of its range, methods and organization. Our recommendations on this head necessarily overlap those of the Indian Industrial Commission and the Public Works Department Reorganization Committee, with which they should be compared. We add certain recommendations regarding the kindred subjects of mining and architecture.

lxxxiv. The Civil Engineering College, Sibpur, should be a constituent college of the University of Calcutta, and should be placed under the direction of a governing body created by charter. The governing body should include representatives of Government of the teaching body of the college, of the engineering profession and of the industrial interests concerned. It should receive stated annual allocation from Government, and should, subject to audit, be allowed wide latitude in expanding this grant, and in obtaining funds from private sources, especially from the industrial interests served by the college. It should have power to make appointments to the staff and to control the curricula of the college.

lxxxv. The college should gradually devote itself wholly to higher or university work, and the lower or technical classes now accommodated in it, should be provided for elsewhere.

lxxxvi. Training up to the degree standard in mechanical engineering should be given at Sibpur, and the necessary additions to the staff and equipments of the college should be provided for. Training up to the same standard in electrical engineering might also be provided later.

MINING.

lxxxvii. The course of study in mining should be maintained and extended at Sibpur

ARCHITECTURE.

lxxxviii. In view of the absence of organized provision for training in architecture, it is desirable that a scheme of training in this subject, which might lead up to a degree, should be organized in Calcutta. This could probably best be done at Sibpur, possibly with the co-operation of the School of Art.

AGRICULTURE.

41. In spite of the supreme importance of agriculture as the predominant economic interest of Bengal, there has hitherto been no attempt to provide organized instruction

in agriculture of a university grade. Government has maintained a number of experimental forms in the presidency; the agricultural college at Sabour was designed to serve the needs of Bengal as well as Bihar, though, under the terms of the Patna University Act, it is precluded from having any connexion with the University of Calcutta. The method of cultivation and of land-tenure prevalent in Bengal do not lend themselves to any considerable employment of highly qualified scientific experts, such as university graduates in agriculture ought to be. The kind of training for which there is widespread need is of a more elementary kind, and is such as, we hope, may be afforded in the agricultural course we have proposed as an element in some of the intermediate colleges. Nevertheless we are convinced that there is need for the service of a limited number of highly trained men, and that it is the duty of the University to provide them. But since the number of posts likely to be available will, for a long time to come, be very small, and since a man trained as an agricultural expert is apt to be regarded as of no use for any other purpose, we feel that the greatest care should be taken *(a)* not to admit more than a reasonable number of students, and *(b)* to provide for them a scheme of training which would fit them for other cognate occupation should a purely agricultural calling not be available.

42. Our recommendations on this head are as follows:—

lxxxix. There should be a department or school of agriculture in the University of Calcutta organized at first on modest lines, and making use, so far as possible, of existing resources. It should have attached to it a demonstration and experimental farm in the neighbourhood of the city. It should work in close relations with the Government Institute of Agriculture which it is proposed to establish.

xc. If and when provision has been made for teaching in Calcutta for an experimental farm, and for opportunities of practical training at the proposed institute, the University should establish a degree course suitable for the training of scientific agricultural experts. The first three years of this course should lead up to a special form of the B. Sc. degree. Thus qualified the student should be admitted for a period of one or two years' practical work in the proposed Government Institute of Agriculture; after which, if his work was certified as satisfactory, he should be eligible for the degree of Bachelor of Agriculture.

xci. Until the opportunities of suitable employment expand provision should be made only for a small number of students.

xcii. A more elementary introduction to agricultural science, suitable for zamindars agents, teachers in agricultural districts, officers of co-operative societies, etc., should be given in selected intermediate colleges.

TECHNOLOGICAL SCIENCES.

43. We regard it as an important and indeed a necessary function of a university, situated in a great industrial and commercial city like Calcutta, to include applied science and technology in its courses and to recognize their systematic and practical study by degree and diplomas. This function must not be confused with that of training foremen and other servants of the scientific industries. The latter is the business of technical institutions of another grade, with the work of which the courses of the University should be so far as is necessary correlated. For example, the University of Calcutta, in the development of its courses of training in applied science, should co-operate with the proposed Calcutta Technological Institute, specially in the use of workshops for the practical training of the students. We hope that private benefactors and the industries concerned will give generous help to the University of Calcutta in its new technological departments, which should not be started until the means of providing

adequate courses of scientific and practical instruction are assured. In view of the great expense of providing these courses and of the comparatively small number of scientific experts whom the industries of India are for the present likely to absorb, care should be taken to avoid any wasteful multiplication of institutions giving technological training in the same branch of industry. In this branch of education there should be a division of labour according to the industrial needs of the different provinces of India. While, therefore, independent action on the part of each university should be welcomed when private liberality enables it to develop this side to its work in the interest of the district which it immediately serves; and while the provincial Government should be free to develop technological training for the assistance of any industry which it regards as important or promising; the Government of India should have an organization (as is proposed by the Indian Industrial Commission) for giving guidance and advice in this matter from all-India standpoint, and should administer funds out of which it may give special grants-in-aid to advanced technological training and research at the universities and elsewhere. The Government of India will thus be in a position to exert considerable influence in securing concerted action among the universities in regard to technological training.

44. Our further recommendations are as follows:—

xciii. Calcutta is a suitable centre for the advanced training of students to meet the needs of the leather industries, the chemical industries (including dyeing), the oil and fat industries and some branches of the textile industries. In several of these departments, the work of the university technological laboratories should be associated with that of the engineering college at Sibpur. So far as possible, the university departments of technology and applied science, should be placed in the neighbourhood of the university Colleges of Science, should be attached to it administratively and should come under the general supervision of its governing body. To each department of technological study there should be attached an advisory committee which should include leading representatives of the industries concerned. Within defined limits the principal university teachers in the technological departments should be permitted to engage in private practice.

xciv. At Dacca the intermediate college should provide scientific and practical instruction preparatory to engineering and agriculture; and the technological research work entrusted to the scientific laboratories of the university should be co-ordinated as far as possible with corresponding investigations conducted in the university laboratories in Calcutta.

xcv. The reform of the intermediate courses is necessary for the development of a general scheme technological training; and the new intermediate colleges should therefore be established as quickly as possible, because their work will serve as a foundation for the university.

COMMERCE.

45. In the training of students for a commercial career the university has a very important but limited function. In all countries the vast majority of those who go into commerce do so at an earlier age than that of graduation at the university. It is at this earlier age, therefore, that preliminary training for commerce can be most usefully given. For this among other reasons we have recommended the reform of the high schools. Bengal needs modern secondary education. The high school certificate, which a boy will gain after receiving a good general education up to sixteen or seventeen years of age, will be a valuable credential to those who wish to

enter upon commercial life immediately after leaving school. But even more useful as a preparation for business will be the training given at the intermediate colleges. We have recommended that these colleges which provide a practical but not narrowly specialized course which will give an excellent training to young men who intend to enter commercial life at eighteen or nineteen years of age. In addition to this we propose that there should be classes in commercial subjects at technical or commercial institutes aided by the department of public instruction and the department of industries. Many of these classes should be held in the early morning or in the evening after office hours. Lastly there is need for advanced teaching in banking, insurance, actuarial science and other subjects bearing upon the commercial interests of the country. In this, the university should take an increasingly important part.

46. It is necessary to guard against the idea that a specialized commercial degree course at a university is likely to be found by any large number of students an *open sesame* to well paid and responsible employment by business firms. The ordinary student, after taking as an undergraduate a degree course in commerce, would find himself handicapped by beginning his commercial career some years later. His difficulties would be the greater if he had acquired inappropriate habits of work, and if he resented having to begin at the bottom of the ladder, below many junior to himself in age. A university cannot teach the practical side of business. A degree in commerce does not necessarily connote commercial aptitude. That must be tested and developed in the office and the counting house. And (save in very exceptional cases) this test must be applied under the ordinary conditions of commercial employment. Part-time attendance at an office, however ingeniously dovetailed into a full undergraduate course, cannot be so organized as to provide for any large number of students an all-round practical training in business methods. Even less practical would it be for the university to examine the work done by the student in the office of a business house, and to pronounce upon its value as part of the qualification for a degree.

47. Nevertheless the university can give a useful training in the science which lie at the basis of commerce. But the students who undertake such a course for their degree must be prepared to recognize the fact that when at last they enter upon employment in a business house, they will have to start upon the same terms as those offered to youths much younger than themselves and not possessing a university degree. They must face the fact that they will have to trust for their promotion to their own ability and trained capacity, not to the academic title which they possess. For students of a special type a degree course in commerce at the university may be an admirable preparatiou for a business career. But students of this type are not very numerous.

48. Our further recommendations regarding university courses in commerce are as follows:—

xcvi. The University of Calcutta should have power to institute, when it thinks fit, a Faculty of Economics and Commerce and to confer degrees and diplomas in commercial subjects. An advisory committee on higher commercial education should be attached to the department of economics.

xcvii. The University should be prepared to provide courses of instruction in banking, accountancy, insurance, actuarial science, industrial history, etc., designed especially for students who are already engaged in business, and at hours convenient for their attendance. Admission to these courses should not be limited to persons who have passed the entrance examination of the university.

MEDIUM OF INSTRUCTION.

49. We have analyzed the great mass of evidence on the medium of instruction and have shown that the divergent views expressed cut across the divisions of race, religion, nationality and occupation.

We have dealt with the psychological problems of mind-training involved in the use of the mother tongue and of the English medium and have suggested that the educated public of Bengal, like many other countries within the British dominions and elsewhere, will probably wish to be bilingual. We regard reform both in the teaching of the vernacular, which should be placed on a scientific basis, and in the teaching of English, as essential, and we have made *inter alia* the following recommendations:—

xcviii. The vernacular should be used in general throughout the high schools, except for the teaching of English and of Mathematics, which, during the last four years of the course, should be conducted in English.

xcix. At the 'high school examination' (corresponding to the matriculation) candidates should be permitted to answer either in the vernacular or in English, except in the subjects of English and of mathematics in which English should be compulsory.

xc. The medium of instruction and examination in the intermediate colleges and university should be English (except in dealing with the vernacular and the classical languages.)

ci. Phonetic methods should be employed in the teaching of spoken English and there should be a *viva voce* test in English both at the intermediate college examination, and at the university examination in that subject.

cii. In the university a distinction should be made between the teaching of English for practical and for literary purposes; teaching of both kinds should be available for all students; but a uniform course in English literature should not be a compulsory examination subject for all students in the Faculty of Arts.

ciii. The scientific study of a vernacular should be encouraged in the university.

civ. To relieve Muslim students from an excessive burden of languages study, Musalmans offering Bengali as a vernacular should be permitted to take Urdu in certain examinations in the place of a classical language.

EXAMINATIONS.

50. We have pointed out that the examination system of Calcutta is probably the largest university examination system in the world. In 1918 the university examined nearly 32,000 candidates.

51. We have analyzed tbe comprehensive evidence dealing with this system, by which education in Bengal is now dominated.

We have pointed out that the university degree is practically the only portal at present to all careers in Bengal and hence that examination reform is a necessary condition for the reform of education. Apparently unimportant details of the examination system profoundly influence the preparation of the students. Thus the mechnical system of marking devised to secure uniformity of treatment encourages pure memorisation at the expense of intelligence and lends to the deterioration of mental efficiency throughout the schools and the university. We have suggested that the purpose of the various examinations should be more clearly defined, that the examinations should be both designed and conducted with such purpose clearly in mind. We have made a number of specific recommendations in regard to the conduct of examinations; but we think that the adaptation of examinations to their purpose and their conduct on rational principles cannot be carried out by mere regulations but must be left to the future university authorities as an important part of their duties. We hope that the boards of examination recommended by us will serve as

the auditors of the examination system and as the conscience of the universities in this matter; they will publish typical specimens of complete examination answers from time to time and constantly bring before the universities proposals for the removal of defects in the examination system and for the introduction of new and improved methods. We also have hopes that certain subjects may be studied by students without their being required to submit themselves to any examination therein, so that a portion of the curriculum may be entirely freed from examination pressure.

The universities should also welcome at certain of their courses, where accommodation allows, members of the general public qualified to profit by it. Such auditors would be subject to the ordinary university regulations and would pay a suitable fee.

52. Amongst our recommendations of detail are the following :—

cv. In order to maintain continuous watchfulness upon the methods and use of examinations, to ensure that they are not so mechanically conducted as to excercise a harmful influence upon teaching and study, and to make certain that the purposes with which each examination is devised are held in view, and are fairly realised, there should be in each university a small board of examinations, whose functions should not be executive but primarily those of criticism and suggestions.

TRANSITIONAL MEASURES.

53. The reforms which we have propossd are of a fundamental character, both from the point of view of administration and of education *per se*. We have made it clear that we think the educational reform which we regard as necessary cannot be carried out without the administrational reforms. But the questions may be raised as to whether it is necessary or possible to carry out the whole of the administrational changes simultaneously. In our view, such simultaneous changes are both desirable and feasible provided that the funds required are available and provided also that there is a sufficient *personnel* available to carry out the heavy work of the period of transition.

54. The changes fall into three main categories: (1) change in secondary and higher secondary education, involving the setting up of the Board of Secondary and Intermediate Education; (2) the creation of the University of Dacca; (3) the reconstitution of the teaching university in Calcutta and the establishment of a new organization for the mofussil colleges.

55. We have said that these changes could be effected simultaneously, but we do not wish that term to be interpreted too strictly. We have borne in mind that in a large class of legislative measures it is found both convenient and necessary to allow a preparatory period to elapse between the passing of an Act and the appointed day on which it comes into force; and that in the case of a complex measure it may be desirable to make different portions of it come into force on different days; and even to allow of by further elasticity remitting the fixing of such 'appointed day' (within limits defined by the Act) to a specified administrative authority. When we say that the administrative changes should take place simultaneously we mean that they should be authorized by a single Act, or by one or more Acts passed simultaneously, and that the 'appointed days' fixed in, or authorized by, those Acts should be reasonably close to one another.

56. We think it possible, however, that both for financial and for administrative reasons Government might desire the transition to be spread over a longer period than that which we have contemplated, and that we ought therefore to indicate the order in which the three changes proposed should be carried out

57. We think there can be no reason for delay in setting up the Board of Secondary and Intermediate Education and in making provision for the reform of secondary and intermediate education, which, as we have said repeatedly, we regard as the very pivot of the whole reform.

58. We have also urged that there should be no further delay in creating the University of Dacca. It is unnecessary to advance further arguments on either of these points.

59. But the case of the University of Calcutta is different and more complex. Apart from any financial and administrative difficulties which might be felt by Government in introducing immediate changes, it may be urged with some reason that the university should not be reconstituted until the new intermediate system comes into working order.

60. But if the Secondary and Intermediate board and the University of Dacca are created, at once, while the reconstitution of the University of Calcutta is postponed, that postponement may take place in three different ways, which give rise to three very different situations.

(*a*) The legislation for the reconstitution of the University of Calcutta might be postponed purely and simply, the Government of India limiting themselves to a statement of their intention in regard to university policy. But such postponement could not leave the Universities Act and the constitution of the University of Calcutta entirely untouched; for although the University of Dacca might be created (as was the University of Patna) without direct amendment of the Universities Act, we think some direct amendment would be necessary to provide for the transfer of the power of recognizing high schools and intermediate courses from the University of Calcutta to the Board of Secondary and Intermediate Education. Such amendment would probably give rise to immediate difficulties. For it would not be easy to limit the amendment of the Act to this single point. Government would inevitably have pressed on it with reason, a number of minor amendments, it might find itself involved in controversy on innumerable points of detail; and yet reforms of detail, desirable in themselves, might, if carried out, only block the way to fundamental reform and make the eventual task of the legislature more onerous. Even more serious, perhaps, is another objection. The colleges would find their arrangements upset by the removal of their intermediate students without finding any authority in position to give them either definite assurances as to their future, or assistance in making the necessary provision for their higher work. Thus there would ensue a trying period of uncertainty and unrest with few compensating advantages.

We think it clear, therefore, that the amendment of the Universities Act should not be made piece-meals but that Government should decide forthwith on its university policy as a whole.

But such a decision would still leave open two plans, (*b*) and (*c*) below, for bringing that policy gradually into operation.

(*b*) The Act reconstituting the University of Calcutta might be passed simultaneously with the legislation bringing into existence the University of Dacca and the

Board of Secondary and Intermediate Education; but the entire operation of the Act other than that relating to secondary and intermediate education might be suspended for some years. This procedure would obviate the disadvantages of piece-meal legislation, and would create a more clearly defined situation. During the period before reconstitution a good deal might no doubt be done by Government and by the University, especially if it had a salaried whole-time Vice-Chancellor, to prepare for the new order of things. But it may be doubted whether the existing organization could be expected to carry out such preparations with enthusiasms; and we fear that this arrangement would not lighten the lahours of the Executive Commission, the appointment of which (though deferred for a time) would ultimately be as necessary as if the University were reconstituted at once.

(c) The third course which we regard as possible would bring the Executive Commission into existence simultaneously with the Board of Secondary and Intermediate Education and the University of Dacca; but the Executive Commission would have more limited powers than those which we have prepared in Chapter XXXVII, and the present Syndicate and Senate would be left to carry on the routine business of the University during a preparatory period. The Executive Commission would negotiate with the colleges in regard to their needs under the new system; it would advise Government in regard to necessary grants for the colleges and for the creation of fresh teaching on the lines indicated in our recommendations; it would deal with the great problems of the residence and health of students and with the provision of sites for hostels; and finally it would advise Government as to the best date for bringing the Act into complete operation. Very soon after that date it ought to be possible for the Commission to transfer its powers completely to the new governing bodies of the University.

61. Like the other schemes for postponement this would spread the financial liabilities of the Government over a longer period, and would diminish the pressure of the change both upon the administrative officials of Government and upon the Executive Commission itself. The chief objection that we anticipate to the scheme is that there might be friction between the Executive Commission and the older university authorities. But the University Act would necessarily delimit the powers of the Commission and of those authorities in such a way as to prevent formal clashing; and we hope that in more informal matters friction might be avoided by the presence of the Vice-Chancellor and of other members common to the Executive Commission and to the Syndicate.

62. We may point out, that if, contrary to our expectations, the University of Calcutta is reconstituted before the creation of the Board of Secondary and Intermediate Education, it will be necessary to set up within the University provisional machinery to deal with the schools.

63. We desire to make it clear that certain reforms in the University of Calcutta ought not to be postponed whatever scheme be adopted; namely, the provision of further

idential accommodation; the provision of eacher's training department and a departnt of education; the provision of addition accommodation for teaching; and the ıvision of measures for supervising and proving the health of the students.

MYSORE UNIVERSITY.

The following extract relating to the ysore University is taken from the Re.rt:—

One outstanding instance of a new type of iversity appealing to local patriotism is esented by the University of Mysore, iich includes the Colleges at Mysore, and ıngalore, the former devoted to arts, and latter to science teaching. We visited ysore and Bangalore at the invitation of is Highness the Maharaja of Mysore and scussed the future of the new university t only with His Highness, but also with Dewan, the Vice-Chancellor, the Regisır and the members of the teaching staff. ıe movement for the creation of the new iversity originated in a healthy desire to ak new ground, especially in two direcns. In the first place the work of the st year of the old college course is to be nducted in a few specially selected high ools. In the second place though to the ret of some of the founders, it was not ınd possible to establish the University in ingle seat, collegiate instruction, instead being widely dispersed is concentrated in ysore and Bangalore. The question wheır these centres should ultimately form two parate universities being left to future exience to decide. We believe that the ındations of the new University have been ly laid and that school boys and college dents alike will benefit by the new derture.

ECONOMICS IN THE WEST.

The Coal Controversy.

London, 18th July, 1919.—We are at the present time passing through a serious crisis in the coal industry—indeed in the entire industry of the country. Last week in the House of Commons the Government dropped a veritable moral bombshell by announcing that owing to the falling off *of coal production consequent upon the* Sankey award it would be necessary immediately to increase the price of coal by six shillings per ton. The effect upon the country was instantaneous. From one end of it to another went up a cry of alarm and indignation. Industrialists especially were moved by what they regarded—and rightly regarded—as a step pregnant with disastrous consequences for the future of industry. Since then there has been a debate in the House of Commons terminating in the conclusion of an arrangement by which the advance is postponed for three months in the hope that increased production at the mines may render it unnecessary. There is a hope that now that the eyes of the nation are opened to the consequences of the enormous enhancement that has taken place in the price of coal, largely as a result of phenomenal advances in wages associated with the adoption of shorter hours of work, there will be a change for the better in production. But it has to be confessed that the signs of improvement are difficult to see in the present conditions of industry and especially of the coal industry. At the present time the most popular miners' leaders are avowed revolutionaries who are far more intent on pushing their subversive views than in promoting the general good of the community.

India, it is scarcely necessary to point out, is deeply interested as a coal producing and and steel manufacturing country in this

question of the home production of coal. If, as is unquestionably the case, the present price of home produced coal is so high as to make export of the commodity impossible to many parts of the world which have hitherto relied almost exclusively on British coal an opening is furnished for the promising dian coal trade such as a few years since could not have been dreamed of by the most sanguine. In this connection some figures supplied to the House of Commons by the Board of Trade, are worth careful study. It was officially stated that while the average price of coal per ton at the pit head was 29*s*. 4*d*. in Great Britain (outside Scotland) it was only 5*s*. 10*d*. in India in 1918. This rate for India was the lowest price given in regard to any country but the Transvaal where coal is raised for 5*s*. 6*d*. per ton. But the Transvaal coal is a negligeable factor and in any case cannot be of much account in the world competition because of the heavy expense involved in railing it to a sea port for shipment. In the future, therefore, it is reasonable to took for a very great extension of the Indian coal trade. Certainly in the markets East of Suez it should have a very fine chance. And cheap coal implies cheap steel, so that in this direction also there should be a good time coming for Indian industry.

The coal controversy has ramified into many interesting channels, notably into a discussion as to how coal can be conserved in manufacturing processes. On this point Sir Robert Hadfield, a great Sheffield magnate, who is one of the Vice-presidents of the Federation of British Industries, had some instructive things to say to an interviewer the other day. The text upon which Sir Robert Hadfield spoke was the present wasteful use of coal. His view was that with proper furnaces and a scientific system of stoking consumption might be enormously reduced. He cited the case of his own firm, one of the greatest steel manufacturing concerns in the country, which at the beginning of the war used 15 cwt. of coal to heat a ton of steel, but which by the introduction of "Wincott" furnaces and other means was able to reduce the consumption of coal to 2 cwt. per ton of steel heated. In nearly all ways, according to this authority, the present methods of using coal are wasteful. The generation of electricity, for example, which at present is carried out by some 600 authorities should be the work of one central authority controlling a few big generating stations. By this means there would, in Sir Robert Hadfield's opinion, be a saving of 55,000,000 tons of coal annually. Summing up, he added that the present coal consumption would, if economically used, produce three times the amount of power. The statement is more cheerful than most we have had in connection with the controversy. And the fact that it comes from an acknowledged expert lends it weight.

A High Commissioner for India.

No feature of the report of Lord Crewe's Committee on the Home administration for Indian affairs recently published has existed more attention in business quarters than the proposal to transfer the agency work of the India Office to a High Commissioner in India. If the proposal is adopted there will necessarily be a great change in the entire method of dealing with India from the industrial standpoint. At present the agency work is largely if not entirely concerned with the provision of stores, and that though a function of enormous importance only very partially covers the field of action open to a department intelligently directing the interests of India in this country. What seems to be desirable is a system analagous to that of the other Dominions where the advancement of the interests of trade is a definite and important part of the functions of the High Commissioner's Department. One notable direction in which there is an opening for India is the creation of a centre

like those associated with the various Dominions and colonies in which the characteristic productions of India might be exposed to public view. Some of the older Anglo-Indian officials may be horrified at the idea of descending to the shop window to advertise India's status among producing nations; but that will not be the general view. These are days of publicity and no country can afford to ignore the most potent means of bringing home to the man in the street the character of its resources. Apart from this consideration no more valuable agency than a well equipped centre in the heart of London could be devised for educating people on Indian affairs. The ignorance of the average home staying Briton on most matters affecting India is lamentable and if it can be removed immense good will result to both countries.

WOMAN'S PART IN THE WAR.

Woman's part in the war has been a remarkable one and in no direction has it been more fruitful than in industry. This fact, frequently demonstrated, was brought out with particular force in some statements made by Lady Parsons, wife of Sir Charles Parsons, the eminent engineer of turbine fame, at a meeting of the north East Coast Institution of Engineers at a recent meeting held to confer honorary fellowships on Sir David Beatty and Sir Douglas Haig. Lady Parsons in the course of her speech condemned the tendency among engineers "to consider that women were capable only of repetition work on fool proof machines." Quite a large number, she said, were able to set and grind their own tools, and a few could set up their job from drawings. In a firm of gun repairers two girls dealt with guns varying from the 13 inch naval gun weighing 50 tons to the 6lb. tank gun. They could design repairs and calculate the factor of safety of a damaged gun by logarithms and slide rule. Binoculars were being entirely made by women. In fact, women were able to work on almost every known operation in engineering. About one and a half million women, she added, had received training in schools that had cost the country £ 30,000,000. A wonderful record truly and one which should leave a permanent mark on British industry. But we hear rather ominous accounts of the attitude of the Trade Unions towards women workers. The Trade Unonists are all for equality when it is a question of woman's admission to the professions, but it is quite another matter when she seeks to take her place by the side of men in the workshops.

CO-OPERATION IN INDIA.

Mr. Henry Wolff's work on Co-operation in India recently published by Messrs. Thacker & Co., comes in for a very discriminating and interesting article in the *Times Literary Supplement*. The writer after describing Mr. Wolff as "the Nestor of Co-operative Credit in the English speaking world" and mentioning that though he has never been able to visit India he yet has kept in remarkably close touch with the workers there, examines his book with sympathetic insight. Dealing with his main thesis that the chief danger to the movement in India is excessive bureaucratic control the reviewer agrees with him. Indeed, he goes further than the author and expresses the opinion that Mr. Wolff has understated the risk owing to an entirely pardonable failure to realize the strength of the forces which make for bureaucracy in Indian life. "In the sub-concious mentality of the people," the writer says, "bureaucracy holds the place which self government occupies with us; it is the national and traditional way of doing things, as familiar to Asoka to Akbar; and when Indians of to-day organize a commercial or even a philanthropical undertaking its familiar features appear with monotonous iteration." Under the new conditions, however, the English influence is destined to be reduced, and Mr.

Wolff's proposals for the future are commended by the reviewer. "The tutelage of the movement must be transferred as soon as possible to unofficial control, and with this object the voluntary workers must be organized so as to form a body competent to take over gradually the work of propaganda and supervision. The Registrars will then be confined to such official duties as are performed by the corresponding officers in other countries, and will be under no temptation to undertake those functions which at present almost compel them to formalise and officialise." The reviewer while giving his verdict in favour of Mr. Wolff's opinions thinks that even under Indian conditions an unofficial body may develop bureaucratic tendencies. Indeed his greatest anxiety is "lest the Indian co-operative movement, the best hope for the economic salvation of the country, should be depleated under the influence of those sub-conscious tendencies" of which he had written. Both the book and the review are notable as an example of the manner in which the economic interests of India are pushing themselves into prominence in this era of reconstruction.

ARNOLD WRIGHT.

INDUSTRIAL NOTES FROM THE UNITED STATES.

RADIO NOVELTIES BORN OF THE WAR.

Washington, D. C., U. S. A., 20th June, 1919.—From the amateur radio standpoint the war has contributed a number of interesting and important innovations. Not the least important of these is the wide application of the vacuum tube which, although employed only by the more progressive amateurs prior to the war, is now extensively used for transmitting as well as receiving. The vacuum is nothing more than an electric lamp of the incandescent type, containing one or more electrodes in addition to the filament. Due to the heated condition of the vacuum existing in this special lamp or tube, certain remarkable characteristics result, and these have been applied to radio communication. Thus vacuum tubes are employed for detecting the weak currents induced in the receiving set by the distant transmitter, for building up or amplifying these weak currents in the event that they are too weak to be heard in the receivers after passing through a single vacuum tube serving as a so-called detector, for generating high-frequency currents used in transmitting wireless telegraph or telephone messages, and for modulating powerful currents by means of relatively weak currents.

Vacuum tubes are so much more sensitive for receiving purposes than the former crystal and other types of detectors that most American amateurs will use nothing else. At least, an amateur may start with the far simpler instruments for receiving, but sooner or later he comes around to the vacuum tube receiver, just as the man who starts with a \$500 automobile often climbs by easy stages to the \$2,500 car. The simple receiving set, costing but a few dollars, may serve quite satisfactorily for receiving messages from nearby

stations. However, when the amateur wishes to keep pace with other amateurs who are in daily touch with European and South American stations, he must purchase the very best apparatus for the purpose.

The vacuum tubes have made wireless telephony practicable and relatively inexpensive. Heretofore, the continuous waves required for wireless telephony were usually generated by an electric arc, with all its attendant troubles such as heavy current consumption, flickering, fluctuating oscillations, microphone troubles, and so on. To-day, thanks to the vacuum tubes available, wireless telephony comes well within the reach of the average amateur all over the world. A simple vacuum tube may be used together with some form of inductance, capacity, simple microphone, motor generator set for supplying a high-voltage direct current, and other accessories, for transmitting fifty miles. Larger tubes give relatively longer ranges. At any rate, it now becomes possible for the euthusiastic amateur to install a wireless set on his automobile or elsewhere, so that he can keep in touch with his home or office and with other stations.

THE NEWLY-INVENTED GEOPHONE.

The geophone is a unique listening device just perfected by the United States Bureau of Mines as an aid to locating miners who have been entombed and for similar purposes.

Observations made in a metal mine showed that direction can be determined much more easily in rock than in coal. This has been found to be due to the fact that there is some reverberation to the sound of a hammer blow on the coal, while on the stone the sound is "clean cut." Experiments show that pounding with a hammer on solid limestone can be heard from a distance of from eight to fourteen hundred feet, and on gneiss rock from six hundred to one thousand, while the sound was almost completely cut off under all conditions by the interposition of a clay seam one hundred and fifty feet thick.

The geophone, though small, is essentially a seismograph, since it works on the same principle as the ponderous apparatus with which earthquake tremors are recorded. It consists of an iron ring about three and one-half inches in diameter, within the center of which is suspended a lead disc which is fastened by a single bolt through two mica discs, one of which covers the top and the other the bottom of the ring. There are two cap pieces, the top one having an opening in the center to which is fastened a rubber tube leading to a stethoscope ear-piece. These cap pieces are fastened with bolts to the iron ring and serve also to hold the mica discs in place.

We then have really nothing but a lead weight suspended between two mica discs cutting across a small air-tight box. If the instrument is placed on the ground and any one is pounding or digging in the vicinity, energy is transmitted as wave motion to the earth, and the earth-waves shake the geophone case. The lead weight, on account of its mass and because it is suspended between the mica discs, remains motionless, or comparatively so. There then is produced a relative motion between the instrument case and the lead weight. The result is that a compression and rarification of the air in the instrument takes place. Since the rubber tube leading to the stethoscopic ear-piece is connected within this space in the geophone this rarification and compression is carried to the ear drum. Usually two instruments are used, one for each ear.

NEW METHODS OF TESTING LUBRICATING OILS.

To find if an oil contains certain solid impurities, add kerosene to half a cup of the oil until the mixture becomes quite thin. This thin fluid is now passed through filter paper or ordinary colorless blotting paper. As soon as all of the thinned oil has passed through the blotting paper or filter is washed with kerosene. The residue that remains, if there is

any, will show whether the oil contains any solid impurities. Impurities of this kind may also be determined in a coarse way by smearing a piece of common correspondence or pad paper with the suspected oil and holding it against the light. If the oil is free from solid impurities the blot of oil will be equally transparent everywhere. If not, the solid particles of sediment will be plainly visible.

To test whether on oil becomes resinous or not, it must be poured in a shallow dish, and it is then to be left for about a week in some warm place. If at the end of this period there is not the slightest evidence of a crust you may consider the lubricant to be all right.

These oils may also be tested by mixing *them with nitric acid. If the oil is pure a* thick mass will form in a few hours. Oils that resinify do not thus clot, but remain very thin.

Among other impurities in oils are to be found injurious acids. When acids occur in lubricating oils they destroy the parts of the machines and other apparatus they lubricate much more quickly than should be the case. A test for such impurities is found in mixing the lubricating oils with copper oxide or copper ash. These are added to the oil in a glass container, when, if the oil is free from acid, it retains its original color. If acids are present their action on the copper makes the color greenish or bluish. This test may also be made by dropping the oil on a sheet of copper or brass. Here it should be left for a week, when at the end of that time if the acid be present, a greenish discoloration will be seen on the metal. Almost any of the chemical tests for acid, as with colored solutions and litmus paper, will indicate the occurrence of acid. Litmus paper turns pink in the presence of acid. In its absence a blue color will be apparent.

A "rough and ready" method to compare the lubricating values of several oils is a few drops placed on a smooth, slightly-inclined metal or glass sheet. Naturally, the lighter oils will reach the bottom first, and should be used on high-speed bearings.

AN INDOOR JACK FOR HEAVY WORK.

For quick action in shifting cars or trucks about in the garage, show room, service station, tire shop, etc., there is real need of a strong, compact, easily operated, quick acting jack that will both lift and transport. For this purpose there has just been invented a jack with a big advantage in these connections; the length over all is but forty inches, which enables the implement to be manipulated to good effect in cramped quarters.

Another distinctive feature is that the wheels of the jack pivot are guided and controlled by the handle. By being able to cut the wheels to right and left it is possible to *gain a degree of quick handling and accom*modation in crowded spaces which even the short construction of the jack alone, would be powerless to give. This applies either to the manipulation of the jack alone, or of the jack when supporting a car.

The leverage is sufficient to lift 5,000 pounds with ease. The ratchet has a range enabling any car to be lifted high enough for any purpose with at most two strokes of the handle. The quick release latch provides for the rapid return to minimum height.

The jack is so designed that the weight of the load cannot throw the handle violently against the car. Although the handle is free and can be held in any desired position when the load is not being lifted or lowered, a light tension balance draws it, when under a load, into a perpendicular position which prevents it from protruding parallel to the floor.

EXPERT DESCRIBES CAUSE OF AUTOMOBILE DAMAGES.

Every automobile owner at one time or another has had occasion to study a repair bill for replacement of broken or injured parts; and more than once, probably endeavored to show the manufacturer that the failure was due to "poor materials." When a part breaks for no apparent reason the owner in

most cases comes to the conclusion that the material was poor.

A recent case of axle trouble will illustrate the point. An owner broke five differential ring gears in succession and not one lasted more than six months, three of them only a few hundred miles.

This owner insisted that the gear material was of an inferior grade and promptly told the car maker so : but an investigation showed that the ring gear was not running true, and that there was point of contact of teeth. Even the strongest nickel steel gear might break down under such conditions.

It is quite true that many parts—such as axle shafts, motor supports, crank shafts, pistons, etc.—may break if the material is of poor quality, but in the majority of cases even the poorest grade of metal for that particular part will stand up for a long period. The design of the part has as much to do with the breakage as the material from which it is made, assuming, of course, that proper lubricating conditions are maintained.

It may be difficult for the owner of an automobile to understand why tool marks on an axle shaft cause breakage; but as a matter of fact this may actually be the case. Tool marks on a bearing surface are exactly like having a few high spots to take the wear and strain.

A highly polished surface has a greater area of contact than an unfinished surface, hence it will not wear so much and can stand up for a longer period.

Closely allied with tool marks as a cause of breakage comes a design error which employs sharp corners instead of rounded corners. If you will look at the wheel spindle of your car you may notice that its innermost end is rounded off instead of squared off. Where it is squared off the chance of breakage is much greater.

The accurate finishing of parts and the rounding of corners all take time and cost money, and hence it is not usual to find this carried out to a great extent on any but high grade cars.

Vibration is another common cause of failure. Crank shafts perhaps more than any other part receive a great deal of vibration because of the various forces acting on this part, and the speed at which it runs. In some cars which habitually misfire this vibration becomes greater and the chances for breakage are increased.

If the shaft is too small and is not well designed in so far as its balance is concerned it may break in a very short time. Even the heaviest crank shaft, however, made twice as thick as usual, and made of superior materials, may break more easily than a shaft if attention is not paid to balance.

Some say that internal stresses break the shaft. It is not easy for the owner to understand how a heavy and apparently stiff piece of high grade metal can bend and twist all out of shape, due to vibration and unbalance, but such is actually the case in the engine crank shaft. If you will remember that even slight hand pressure on a table or even on a stone wall causes a slight (though not measureable) compression it will be easy to see how the many tons of pressure to which a crank-shaft is subjected at times may cause the shaft to bend out of shape.

There is another cause of failure in parts—namely, that due to a weak section or use of too little metal. Every time a hole is bored in a piece of metal it weakens it just that much. The more metal the stronger the part. Some cars have parts so small in section, or thickness, at places that they soon break at that weak spot. Where small sections are used for lightness the maker must resort to the use of better quality material and better finish of the part.

Where two surfaces are supposed to rub they must be as smooth as glass and fitted so that they rub all over. If only a portion rubs, then that small portion takes the strain and that which does not rub does no work.

MERCHANDISE DELIVERIES BY AIRPLANE.

At last the anticipated has materialized. Several of the larger department stores in the eastern cities of the United States are successfully carrying on deliveries of goods by airplane. These aerial delivery systems are now being used to deliver purchases at the various summer resorts on the Atlantic coast. They are the first business houses in the world to actually employ the airplane for strictly utilitarian purposes—the delivery of merchandise from store to customer.

The planes used have special arrangements and facilities for carrying parcels. In the fore cockpit there is ample space for about 400 pounds of merchandise, safely stowed away and protected from the elements. The airplane trips are made on regular schedule time three times a week. At present four airplanes and six pilots are always available.

These airplanes also carry mail from New York, and Newark to Asbury Park, Atlantic City and other coast points. They are the first private enterprise to carry mail by air routes. In this way the government, through the Postoffice Department, is co-operating with commercial enterprises in the endeavor to encourage public interest in aeronautics.

Some of the larger stores are contemplating using "Blimps" for carrying extensive cargoes considerable distances, as soon as these are commercially available. All of the commercial airplanes now in use and to be utilized in future will be magneto equipped.

Regular government mails are already being carried from Boston, New York and Philadelphia as far west as Chicago and St. Louis, and plants are now nearly completed for extending this service into the northwest as far as St. Paul and Minneapolis. It is freely predicted that within a year the mails will be transported between New York and San Francisco by airplane, landing places enroute having already been selected.

ALFRED T. MARKS.

NOTES.

We published in this issue an article based on the Canadian Bureau of Statistics Report on the pulp and paper industries of Canada. In the two years between 1915 and 1917, the value of the production of Canada's pulp and paper mills grew from $ 40,348,001 to $ 96,340,327, or by 140 per cent. In the same period the consumption of pulp wood increased from 1,405,836 to 2,104,334 cards. The capital invested in 1917 amounted to $ 186,787,405. Here is an object lesson for us in Mysore, where we have been talking of a pulp and paper mill for over three years now.

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A new journal of interest is the *British and Continental Margarine and Allied Trades Journal.* It is a live journal and is well written. The Overseas' Causerie, is we think, written by a person who knows what he is about. It is full of informed criticism and timely suggestion. We wish our contemporary every success.

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In connection with the article on Mica Mines in Southern India we published in the *Journal* some time back, the report drawn up by Mr. G. A. Tipper, Assistant Superintendent, Geological Survey of India, published in this issue will be read with interest. The Madras Government state that the Director of the Indian Geological Survey agrees with the conclusions and recommendations contained in Mr. Tipper's report.

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Among coming universities are those of Travancore, Baroda and Indore.

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A parsi gentlemen has just left a legacy of fifteen lakhs of rupees to the members of his own community. The interest on the amount is to be

scholarships to students for study in Japan, America and England.

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At the sixth meeting of the Education Section of the Board of Industries, held on 6th August, at Lucknow, the following among other matters were dealt with. A number of resolutions passed by the Advisory Committee of the School of Arts and Crafts were disposed of including the proposal to establish an Architectural class and a book-binding class and the linking up of the new, Jewellery and Metal working class with electric power all of which were approved. The Board recommended the construction of a hostel for Indian students and quarters for the Vice-Principal at the Technical School, Lucknow. The question of the appointment of a whole time Principal for the Dyeing School was considered and a candidate was selected and recommended for the post. The Board also recorded orders of Government sanctioning the establishment of peripatetic weaving schools at Benares and Mau District Azamgarh, and of a Leather Working School at Meerut, the opening of a class at the Technical School, Lucknow, to continue provisionally for a year for the training of disabled solders in motor driving. It also expressed its appreciation at the award of a number of additional scholarships to the value of Rs. 10 and Rs. 5 in the mechanical classes at the Technical schools, Lucknow and Gorakhpur.

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Information on the progress of the sisal industry has been published in the *Ann. Rep. Dept. Agric., British East Africa,* 1916-17, in which it is estimated that the area devoted to this crop now amounts to 15,000 acres. The production amounts to about 400 tons per month, and it is expected that it will soon increase to between 700 and 800 tons per month, or about 8,000—9,000 tons a year. A hydro-electric plant has been erected about 3½ miles below the junction of the Chania and Thika Rivers for the purpose of supplying power to certain Sisal hemp factories, and similar schemes are under consideration for providing electric power for other factories. There is a practically unlimited area in the protectorate suitable for sisal cultivation, and the further development depends on the introduction of capital and the supply of the necessary labour.

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During the war the proper provision of life belts and other life-saving appliances on ships became of vital importance owing to the submaring menace. One of the most widely used appliances was a life-jacket stuffed with "kapok" or floss. This floss has very great buoyancy, a jacket containing 24 oz. of the fibre being capable of supporting an adult in the water. According to the existing official regulations the only kapok that may be used for this purpose is Java kapok and consists of the long hairs surrounding the seeds of a tree which occurs abundantly in the Dutch East Indies. A similar material is, however, obtainable from India, but from a different tree, and this Indian floss cannot under the existing regulations be used for life-jackets. The results of trials made at the Imperial Institute, details of which are given in the current number of the *Bulletin of the Imperial Institute*, have shown that the Indian floss can fully satisfy all the requirements as regards buoyancy and freedom from water-logging. It is therefore suggested that the use of Indian kapok should be officially permitted for life-jackets. Enquiries made by the Imperial Institute showed that kapok, equal in quality to that used in the trials, is available in India in large quantities.

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His Majesty's Commercial Secretary at Yokohama reports that a meeting of factory inspectors stationed in different parts of Japan was recently held at the Department of Agriculture and Commerce at Tokyo.

The chief difficulty before the factory inspectors, according to one of the representatives who addressed the meeting, was the enforcement of the provisions of the Japanese Factory Law relative to the restrictions of working hours and the employment of juvenile labour. The factory law has entailed a reduction to twelve working hours per day whereas formerly the working day was in some cases seventeen hours. The employers have thus been obliged to adjust their factory methods but seem to have obtained in a twelve hours' working day the same output as was formerly attained in seventeen hours. No factories seem to have discharged operatives as a result of the enforcement of the factory law but in some cases the number of operatives has been reduced to fourteen or less in order to avoid the application of the Act. He went on to say that factories coming under the Act showed a much better condition than others and that generally speaking the Act had proved a great advantage to factory employees. Employers in textile mills had applied for an extension of the postponement of the twelve-hour rule but in vain, and all textile industries are now subject to the twelve-hour rule. The times have advanced and in view of the particular importance attached to the labour problem in Europe and America, it was impossible to grant any further concession to the masters; it was incumbent on the latter to realize, in order that the factory Act might be a success, what they owed to their operatives and that operatives should themselves realize what their rights and duties were.

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In pre-war times the opium used in this country for medicinal preparations and for the manufacture of morphine was obtained from Turkey and Persia. It was at one time believed that Indian opium was not rich enough in morphine to be employed for these purposes. Although this is true of a large part of the opium prepared in India for export to the East, it is now clearly established that opium suitable in every way for medicinal use in Europe and for the manufacture of morphine can be readily obtained from certain areas in India. So long ago as 1896 the Imperial Institute suggested to the Government of India that the production of medicinal opium for experts to Europe should be undertaken. No action was however taken in this direction until 1907, when the question was again considered at the suggestion of the Imperial Institute in connection with the restrictions which were then placed on the future export of Indian opium to China. Finally, after the outbreak of war, the Government of India permitted the export of a certain quantity of opium to the United Kingdom for use by manufacturers of morphine, and it is hoped that the trade thus begun will be developed and firmly established. The proof that Indian opium is of much better quality than was previously supposed is mainly due to investigations carried out at the Imperial Institute. In a detailed report published in the *Bulletin of the Imperial Institute* in 1915 it was shown that of 102 samples of opium from different parts of India about half could be substituted for the best Turkey and Persian opium employed in European medicine, whilst an additional 25 per cent could be used for special medicinal purposes for which a smaller proportion of morphine in the opium is sufficient. The results of further investigations, which are published in the current number of the *Bulletin*, confirm the earlier opinion as to high quality of Indian opium. The average amount of morphine in 24 samples from various parts of the United Provinces was found to be above the highest standard demanded by the British Pharmacopoeia. In fact 19 of them were so rich in morphine that they would need dilution with lower-grade opium before they could be used for medicinal purposes in the United Kingdom. Similar results were obtained in the case of 12 samples of Benares opium, representing the different kinds available for export, all of which were found to be quite suitable for medicinal use or for manufacturing purposes in the United Kingdom.

GLEANINGS.

Considerable interest has been aroused n Brazilian commercial circles by the visit o Brazil of the Vice-President of the Chamber of Commerce of Tokio. He has visited the coffee districts of Ribeirao Preto and other agricultural districts of the State, of Sao Paulo, and has been received at a special session of the Rio de Janeiro Commercial Association, to which he was accompanied by the Japanese Minister. In reply to a speech of welcome he referred n eulogistic terms to the great future which Brazil offered as a market for Japanese manufactures, and stated that on his return to Japan he would endeavour to bring about a visit of Brazilian delegates to that country. The Japanese Minister also addressed the assembly and, in the course of his speech, referred to the monthly service which Japanese steamers already maintained with Brazil, and which would shortly be increased. He also expressed great hopes as to the strengthening of commercial relations between the two countries which would result from the opening of the branches of the Yokohama Specie Bank in Brazil, for which a charter had already been solicited from the Brazilian Government.

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A body entitled "The National Industrial Corporation of Africa, Ltd.," has been incorporated on the initiation of the National Bank of South Africa, Ltd., with a view to financing and fostering industrial undertakings in South Africa. It will specially devote itself to the encouragement of industrial enterprise by means of financial aid and otherwise as may seem desirable. The Corporation is prepared to provide financial assistance to approved concerns in the form of long-dated loans and by subscribing capital, repayment of which may be extended over a longer period than is usually conceded by bankers. The present company is taking up the work which has for some years been carried out by another well-known company. South African industries have received a considerable impetus during the war, as the Census statistics published from time to time in the *Board of Trade Journal* show. Ample scope exists for the creation and extension of industrial enterprises in the Union, where raw material is, of course, abundant.

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Mr. Andrews recently wrote in the *Modern Review*:—'Nowhere in the world, except in Japan and China, are cotton mills worked at such long hours and under such exhausting climatic conditions as in India. The Indian Factory Act allows a working day of twelve hours' full work, the only stipulation being that there must be an interval of half an hour, in the course of the day's work, during which the machines are not to be used. The Mill may therefore run from 6-30 A.M. in the morning to 7 P.M. at night, with only an interval of half an hour in the middle of the day for food and rest. When we compare such a day with that common in English or American mills, we find that the Indian mills are kept running between twenty-four and thirty hours longer each week than those in the industrial West. The Indian mills run for 72 hours per week, the mills in England and America run between 42 and 48 hours per week.'

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No fewer than seven new sugar mills "go about" for the first time in Cuba this year. The largest will, if weather and labour conditions are favourable, produce 15,000 tons of sugar, the average output per factory among the newcomers being about 10,000 tons. Mr. H. A. Hinely places the 1918-19 Cuban crop at 4,010,571 tons against Gun-Meijer's figures of 4,600,000 tons. Mr. Hinely estimates the General Delicies will produce during the season 93,000 tons of sugar, the next largest producers being the Chaparra with 78,000 tons and the Boston

with 77,000 tons. Other large producers will be the Stewart (75,000 tons), the Manati (71,000 tons), and the Espena, Carragua and Moran (64,000 tons each). In Mysore we are still practically where we were in 1914.

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By two Decrees recently published, the coffee monopoly will not come into force in Italy, and it is probable that a law will be passed, based on the principle of freedom of commerce with a tax on a sliding scale according to the place of origin. The first Decree (No. 1064) prorogues the coming into force of the monopoly of substitutes of coffee, and the second (No. 1066) prorogues the application of the Decree of 18th May to the abolition of the tax on the manufacture, and of the communal customs on substitutes of coffee.

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The shortage of coal has turned the attention of scientists to the possibilities of deriving power from the river Rhone, and the Government has planned a gigantic hydro-electric scheme developing 750,000 horse power. The damming of the river will render it navigable for vessels of 1,200 tons to Switzerland, whilst it will also irrigate vast fertile tracts of land. It will take fifteen years to complete the scheme, which is estimated to cost £ 100,000,000.

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About 250,000 acres are under Cocoanut palms in Travancore. The estimated crop may amount to about 500 million nuts on a rough idea of 2,000 nuts per acre. About 175 million nuts are consumed in the country and the balance exported in the form of Copra oil and whole nuts. The Director of Agriculture in Travancore thinks that if proper attention were paid to cultivation and manuring the output per acre could be easily doubled.

The Australian Commonwealth Government are making investigations with a view to finding suitable raw material in Australia for the manufacture of paper in large quantities. Up to the present time nearly the whole of the paper used in Australia is imported.

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The *Board of Trade Journal* for 31st July in a special article indicates clearly the scope of the amending Bill relating to the Patents and Designs Act, 1907, which was recently read a second time in the House of Commons.

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A writer in the *Manchester Guardian* states that whilst the paper industries in 1911 employed 400,000 work people, only 39,000 of these were engaged in paper manufacture itself.

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The plantation of new joint-stock companies is the order of the day in Calcutta. In Mysore, *seniper idem* seems to be the rule in regard to this matter.

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The *Paper Container* is a new shilling monthly trade Journal dealing with the manufacture of paper bags, cardboard boxes and containers.

TOPICS FROM ECONOMIC PERIODICALS.

PREPARATION AND PRESERVATION OF FOOD.

The Food Investigation Board of the Department of Scientific and Industrial Research, 15, Great George Street, Westminster, London, S. W. I. which was established with a view to "organize and control research into the preparation and preservation of food," has just issued its Report for the year 1918. It is explained in the Report that when the Board was founded there were in existence three bodies concerned directly or indirectly with questions touching food, namely, the Public Health Department of the Local Government Board, the Development Commission and the Medical Research Committee. The Board have points of contact with each of these Departments. But in its broad aspects their field of work is distinct. The scientific work of the Board lies not in the production but in the handling of food. Their responsibility is to the manufacturer and the distributor and their aim the organization of scientific research in those branches of science cognate to the preparation, storage and distribution of food. A number of Committees and Sub-committees have been established and they are engaged in the study of special problems. An idea of the investigation actually in progress can be gathered from the following extracts from the Report describing the work of each Committee :—

FISH PRESERVATION COMMITTEE.

The terms of reference to the Committee are wide, the object being to deal with all aspects of the handling of fish once they have been caught.

The Committee have been mainly occupied with the investigation of a method known as brine freezing, in which the fish to be frozen are plunged into strong brine cooled to 10° F. or lower. Owing to the high specific heat of the brine, cooling is much more rapid than in the ordinary air freezing process and the separation of fluid and solid in the tissues which occurs when extraction of heat is relatively slow is thereby prevented. The flesh of the fish remains firm when thawed out and colour and superficial appearance are preserved.

The method was tried many years ago by Messrs. J. & E. Hall, but the time was not then ripe for its acceptance. More recently it has been developed into a working process, especially in Denmark, and the Committee understand that it is in use in the Scandinavian countries and in Germany.

The present position with respect to brine-freezing may be briefly stated as follows. The Committee are satisfied as to the soundness of the process both as regards the scientific principles involved and the complete preservation of the fish which results. It remains then to determine how far the process is commercially feasible. For this, experiments on a commercial scale are needed. Arrangements were made to carry these out early in the year but, for reasons connected with the war, they broke down. The Committee are engaged upon the largest scale experiments of which the plant now at their disposal is capable. Determinations of the keeping qualities of fish preserved by brine-freezing when stored for long periods are also in progress. Experience has shown that this needs examination.

The development of a method for dealing with gluts of fist by the application of brine-freezing may be said to be the immediate work of the Committee. Other more general problems such as the specific character of the bacteria which live in the tissues of fish, and the advantage or disadvantage from the points of view of putrefaction of gutting the fish before freezing, are being taken up as thoroughly as the difficulties imposed by the times on the getting together of a staff of investigators permit.

ENGINEERING COMMITTEE.

The work of the Engineering Committee may be said to be a continuation of that of the Refrigeration Research Committee of the Institution of Mechanical Engineers who were appointed to consider and define astandard in refrigeration and its units of measurement.

It was decided at the outset to leave questions concerning refrigeration engines for the time being and concentrate upon the problems presented by the development of cold storage, namely, the type of wagon or barge best suited for the carriage of frozen produce on railways or waterways and upon problems of insulation.

The Insulation Sub-Committee have established a plant at the National Physical Laboratory for

experiments upon the influence of the nature and construction of the walls upon the flow of heat into a closed space, and Dr. Ezer Griffiths, a member of the staff of the Laboratory, is conducting the experiments under the immediate supervision of Sir Richard Glazebrook.

The changes of food preserved in cold stores are largely governed by the degree of humidity, and it is therefore important to the industry to be in possession of instruments capable of recording the quantity of moisture in the air of stores. The designing of simple and reliable instruments to measure the very low tension of aqueous vapour which exists at low temperatures is best with difficulties. Professor Tyndall, of the University of Bristol, has devoted considerable attention to the subject of accurate hygrometry, and the Committee decided to assist him to continue his researches, and also to initiate experiments at the National Physical Laboratory.

MEAT COMMITTEE.

The work organized by this Committee covers a wide range. It has long been known to the industry that whereas mutton can be frozen without impairing its qualities, beef needs much more careful treatment. Freezing in the ordinary way, that is by cold air, causes a separation of fluid in the substance of the muscle fibres, with the result that on thawing, unless somewhat elaborate precautions are taken, there is loss of water and soluble constituents, and the texture of the meat is impaired. The Committee therefore dicided to set up an enquiry into the cause of the peculiar sensitiveness of beef to freezing. Is it, for instance, due to the difficulty in abstracting heat from the tissues of so large an animal as the ox, or is it due to the colloidal properties and chemical constitution of the muscle fibres themselves? Is the permeability of the sarcolemma of tbe muscle fibre of tbe ox different from that of the sheep?

The answer to questions such as these can be found only in accurate and detailed measurements in the laboratory. They belong to biophysics and by no means to the least intricate region of that science. Detailed determinations of the co-efficients of conductivity of heat, and of diffusion of salts need to be made as well as large scale experiments upon the carcases of freshly killed beasts. Fortunately both heat flow and tbe diffusion rates of salts are governed by similar equations and the theory of dimensions is applicable in its simplest form. Experiments in the laboratory on the carcases of small animals can therefore be utilised freely.

This work as a whole is under the general supervision of Professor W. M. Bayliss, the laboratory work being conducted in his laboratory at University College, London, where a special experimental plant for investigations at low temperatures has been installed. For the large scale experiments a cold store has been acquired in the north of London through the kindness of the Colonial Consignment and Distributing Company, Limited.

Nothing could better illustrate the wide application of organized research where the basal problems are not lost sight of than this work. The results so far obtained promise not only knowledge immediately useful to the cold storage industry, but also a fundamental contribution to the theory of the colloidal state and a fresh insight into the distinctive colloidal characters of the living substance of the animal and the plant.

The dietetic value and the sapid qualities of meat as it reaches the consumer are determined by *post mortem* changes in chemical constitution. These, which are known under the general title of autolytic changes are little understood. The chemistry, for instance, of the substances which confer flavour is completely unknown. An intensive study of autolysis has been organized in the Biochemical Laboratory, Cambridge, under Professor F. G. Hopkins. The experiments are being conducted by Mr. W. Fearon, with the assistance of Miss D. Foster. A study of the influence of blood upon the rate of autolysis is yielding results of interest and, possibly, of practical importance. The isolation and study of hitherto unknown flesh constituents which appear to play a part in survival changes is proceeding. Comparative analysis of beef and mutton in various conditions are also in progress.

Under industrial conditions the normal course of autolysis as it occurs in sterile tissues is modified to a greater or less extent by bacteria and moulds. Arrangements therefore have been made for the study of what might be called the pathology of the meat industry in close association with the study of autolysis. Dr. Graham Smith is engaged upon the study of the life history of putrefactive organisms in the Pathological Laboratory at Cambridge, and Mr. W. Foreman works in the School of Agriculture upon the chemical changes induced by them.

This work so far as it has progressed up to the present may be sketched as follows. The organisms found in meat in the earlier stages of putrefaction are being isolated in pure culture and their mode of growth followed. Special attention is being given to the effect of temperature and of the chemical composition of the medium in which they are cultivated upon the rate of growth. In order to establish the nature of their action it is necessary to discover some method of sterilising meat which shall not so change its physical and chemical character as to

ender the results of experiments incapable of application to the actual conditions existing in the industry in which the organisms have to make good their footing and grow in flesh which has been subject only to intrinsic *post mortem* change. Sterilisation by heat obviously is inapplicable. This problem is one of considerable difficulty, and it must be solved before real progress can be made.

In order to follow the action of the organisms, rapid and accurate methods for estimating the extent of chemical change induced in the flesh are necessary. Mr. Foreman is working at these methods of analysis with much promise of success.

A systematic investigation of the moulds which affect cold stores is in progress under Mr. F. T. Brooks, who is at present working at the imperial College of Science and Technology. Attention has already been directed to the need for differentiating between meat attacked by putrefactive bacteria and that infected only by surface moulds and to the possibility of saving considerable quantities of the latter for consumption.

Certain special investigations are in charge of Captain L. F. Newman, A.S.C., lent for this work by the War Office. One of these is an attempt to measure the dietetic effect of small quantities of dried blood when added to the ordinary fattening diet of the pig. It has been claimed that the addition of the blood is followed by a striking increase in the rate of increase of weight of the animals. Captain Newman's experiments are designed to test the accuracy of this claim.

The general plan of the organization briefly outlined above may be summed up by saying that the Biophysical work has its head-quarters in London at University College, and the Biochemical work, both normal and pathological, in the Biochemical, Pathological and Agricultural Laboratories at Cambridge.

Oils and Fats Committee.

The Committee was formed to investigate certain questions submitted to the Department by the Oils and Fats section of the Ministry of Food and referred by the Advisory Council to the Board. The general nature of the enquiry to be undertaken is defined in the terms of reference as "a survey of the sources of supply of edible oils and fats with the object of increasing the proportion available for human consumption."

At the request of the Committee the Oils and Fats section of the Ministry of Food carried out a preliminary statistical survey of the quantities and nature of edible oils used in industry in processes such as tanning, the tempering of steel, etc., and a general survey memorandum of the chemical problems involved was prepared by Professor A. Lapworth, Professor of Chemistry in the Universitiy of Manchester, and Professor R. Robinson, Professor of Organic Chemistry in the University of Liverpool. The outcome of the discussion of these documents was the formation of two sub-committees, the first of which may be styled shortly the Chemical Sub-Committee.

The refining of edible oils is practically a new industry in this country and it offers many problems such as, *e.g.*, the evaluation of a definite chemical standard of quality. The function of the Chemical Sub-Committee is the survey of this field of research and the co-ordination of the work.

The second sub-committee, under the Chairmanship of Colonel Sir Frederick Nathan, K.B.E., was formed to confer with leading chemists actively engaged in those industries which consume sensible quantities of edible oils with the view to discovering substitutes.

In addition to the broad field of work outlined above special questions have been remitted to the Committee by the Ministry of Food, such as the distribution of accessory food stuffs (vitamines) in edible fats of various origin and history, and the presence of traces of nickel in hardened fats.

Questions concerning the presence of accessory food stuffs in oils and fats must necessarily engage the attention of the Committee since they in part define the dietetic value of edible fats. They have in this region the promise of all the assistance necessary from the Medical Research Committee who have organized a powerful committee to carry out research covering the whole field of accessory food substances. Arrangements have been made to keep the two bodies in touch whenever the special relation of these substances to fats arises.

Fruit and Vegetable Committee.

The work of the Committee has been hampered by a technical difficulty. Fruit and vegetables are living structures which are killed by being frozen. Experiments, therefore, must be conducted within a narrow range of temperature at or about the freezing point and instruments are needed capable of maintaining a given temperature within the range for long periods and very exactly. Existing thermostats are designed for the regulation of temperature above that of the surroundings by controlling the influx of heat from some source. No device for the accurate regulation of temperature by control of the influx of cold exists, and this is what is needed for the work on fruit and vegetables.

Research under the Committee is in progress at two centres, namely, at Cambridge under Dr. F. F. Blackman, and at the Imperial College of Science

and Technology, London, under Professor V. H. Blackman and Professor J. B. Farmer.

The part of the general work on Fruit and Vegetables taken up at Cambridge may be described as a study of the normal physiology, at low temperatures, of those parts of plants which are used for food. These are nearly always massive, bulky tissues in which the gaseous exchange of respiration is thereby rendered slow and difficult. The influence of the composition of the surrounding atmosphere, of its content of oxygen, carbon dioxide and water vapour, was an obvious point to begin at, and such work has been taken up by Dr. F. Kidd. For the present and until a suitable apparatus for the regulation of cold is available he has been working at these influences at ordinary temperatures.

The composition of the air of fruit stores has been suspected of being of importance and this calls for thorough elucidation. Interesting results in stopping the sprouting of stored potatoes have been obtained, and a number of data with various fruits proving the importance of the composition of the air.

A sound line of work has been taken up by Miss M. Wheldale, who is studying the oxidising enzymes in fruits, which are responsible for the browning of the flesh of ripe fruit. New knowledge has been obtained on the distribution of these oxidases and the factors which are concerned in their activity.

Work at the Imperial College of Science and Technology was begun only in May of this year, so that the investigations have been mainly of a preliminary nature and have been confined to a study of apples.

The work falls under four heads: a study of the chemical changes occurring during the maturation and storage of the fruit; a study of the effect of various external conditions upon the fungi which cause deterioration of stored fruit; a study of the condition to which fruit is subjected in commercial cold storage, and the testing of a small refrigerating plant for laboratory purposes.

It is proposed to follow out the chemical changes occurring in fruit during maturation and storage by investigating the chemical and physical behaviour of the expressed juice of apples stored for various periods, both under normal conditions and also at low temperatures. For such work it is very important to have a method for obtaining with ease and rapidity satisfactory samples of the sap. Various trials have been made, and as a result the procedure now employed is to cool out portions of the apple for 16-18 hours in a freezing mixture, and then express the juice with a small hand press. This method gives an extract which, so far as substances of small molecular weight are concerned, seems to afford satisfactory samples of the sap of the fruit. Substances of high molecular weight, such as pectins substances, are, however, held back to a considerable extent, for it is found that later portions of the expressed sap have a much lower viscosity than that characteristic of the early portions. This point is being investigated further.

As a complete carbohydrate analysis of the sap cannot be carried out in a few hours, it became necessary to develop a method by which the sap could be stored under conditions in which it would undergo no alteration. As a result of a number of experiments the following procedure has been adopted. The freshly expressed juice is neutralised with calcium carbonate, boiled rapidly to destroy enzymes, and filtered. The filtrate is treated with basic lead acetate which precipitates tannins, dextrins and pectin; it is then filtered and the excess of lead removed with sodium carbonate. The solution can then be preserved under toluene for an indefinite time.

With a view to the possibility of following the nitrogenous metabolism of the apple the nitrogen content of the sap was determined. It was found to be extremely low, only 0·00014 grams. nitrogen per cc. of juice being present in the sample tested. Of this nitrogen 40 per cent appears to be present as ammonium salts, the rest as simple amino-acids; no measurable amount of protein could be detected in the sap.

It is proposed to follow the changes in the carbohydrates by determinations of the quantities of (*a*) starch, (*b*) cane sugar, (*c*) reducing sugars (maltose glucose, fructose, pentoses) in the expressed juice, using mainly the methods of Davis, Daish, and Saw Sawyer. For the estimation of reducing sugars various methods have been tried, and that of Bertrand finally adopted, since it is a fairly rapid one and has a very sharp end point.

The physical changes progressively occurring in stored apples will be studied by expressing the juice from samples taken at regular intervals and investigating (1) depression of the freezing point, (2) density, (3) viscosity, (4) electrical conductivety, (5) concentration of hydrogen ions. The latter concentration will be compared with the acidity determined by titration. The apparatus for investigation of the hydrogen ion concentration, and that for electrical conductivity, is now in working order and a number of observations have been made. It has been shown that the presence of non-electrolytes in the sap markedly reduces the electrical conductivity; in deducing the content of electrolytes from the electrical conductivity of such sap, allowance must

therefore be made for the presence of non-electrolytes. In previous work on plant saps this source of error has been entirely overlooked.

An examination of the effect of external conditions on the growth of fungi producing the decay of stored fruit has been undertaken by Dr. W. Brown. The various fungi concerned are being isolated and the effect on their germination and growth of low temperatures and of various concentrations of carbon dioxide is being studied.

Preliminary observations upon the temperature and moisture conditions in a commercial cold storage plant have been made by Dr. Brown at the cold storage plant of Messrs. Mount and Son, of Canterbury, following on observations made during a visit to Canterbury by Dr. F. F. Blackman, Professor V. H. Blackman, and Professor J. B. Farmer. The temparature of the apples and of the air of the chamber has been taken and the humidity of the air measured. It was found that while the humidity of the general air of the chamber was about 85 per cent the air immediately adjacent to the apples, which are stored in boxes, had a moisture content of 98 per cent. The cooling machine when first started was not working up to its full power, so the readings obtained of the rate of fall of temperature of the apples cannot be regarded as being normal.

Trials have been made of the suitability for exact experiment of a small commercial refrigerator. Its cooling action depends on the evaporation and condensation of sulphur dioxide which is circulated by means of a pump driven by an electric motor; the machine is air cooled by means of a fan and radiator. The apparatus has a device for controlling temperature by an automatic starting and stopping of the motor when the temperature rises and falls. The machine as first supplied had a number of small defects and was under-power, and there has been delay in obtaining a more suitable motor. Such a motor, however, is now available, and the small defects have mostly been remedied. The apparatus can doubtless be made to work well as a small refrigerator for the laboratory if the packing of the pump remains gas-tight. For fruit storage it will require some device for cooling the air before passing it over the apples in order to avoid the condensation of water upon the fruit. The refrigerator just mentioned is of course a very small-scale plant and as the work goes on and the actual problems become clearer, it will be necessary to erect a refrigerating plant with several chambers.

CANNED FOODS COMMITTEE.

The Committee was established on November 1st, 1918. The terms of reference to the Committee are as follows:—

To consider and report upon the Bacteriology and Chemistry of:—

(1) Canned and Glass-packed foods preserved by heat and hermetic sealing; and

(2) Condensed Milk.

POSSIBILITIES OF A FIR AND SPRUCE LUMBER TRADE IN INDIA.

Mr. E. A. Greswell, I.F.S., contributes to the *Indian Forester** the following article on the possibilities of a fir and spruce lumber trade in India:—

As Spruce and Fir have come to the fore under stimulus of the war demand, and working-plans of these forests are either being drawn up or are contemplated, it may not be out of place for the writer to put forward a few reflections based on the expeirence he gained while supervising the munitions timber supplies from the Punjab during 1917 and 1918.

Prior to the war the extensive tracts of Fir and Spruce forests in the Punjab and Kashmir had generally not been touched. Such logs and scantlings as reached the river depots were the outturn of trees standing in Deodar and Kail forests; these were felled purely for sylvicultural reasons and the price obtained barely covered royalty and extraction charges.

Such was the position up to the end of 1916 when the war demand began. In the ensuing two years, approximately 80,000 tons of coniferous lumber were supplied from Punjab depots to oversea bases and against various Indian indents, an amount in itself possibly less than the total extra tonnage absorbed by the Railways and Military Works Department for overseas and local consumption respectively.

Under this strain the available supplies of Deodar, Kail and Chir were rapidly exhausted and never adequately replaced, proving that the more extensive exploitation of these species is not yet possible. The deficiency, however, was fully made up by the ever-increasing supplies of Fir and Spruce especially from Kashmir. The overseas bases, chiefly Basra, received 20,000 tons of this timber, while the Military Works Department, which came late into the market used it extensively on temporary barrack construction. The market price of the beam 14′ × 12″ × 6″ and over in length and section rose from a pre-war

*Issue of June, 1919 (Vol. XLV, No. 6), copies of which can be purchased at the "Pioneer" Press, Allahabad, at Re. 1. The following are the other important articles in the volume:—The Board of Forestry, 1919, Triennial Meeting; The growth of Sal from Broadcast Sowings, by G. M. Cooper, I.F.S.; The Food Plants of Indian Forest Insects, Part III, by C.F.S. Breson, M.A., Forest Zoologist.

rate of Rs. 5 to Rs. 12 each, and of the log from annas four to Re. 1 per cubic foot.

It is, of course, too early to offer an opinion as to its durability in the works on which it has been used. Large quantities were supplied as crating to Cawnpore factories, and now as tea chests to Calcutta; there is little doubt that for purposes of this nature it has no rival. As lumber for building works, however, local trade opinion has been in the past so antogonistic to its use that its suitability appears open to doubt. While its susceptibility to damp and, of course, white-ant attack is admitted, yet the absence of any proof as to its defects on other grounds justifies the assumption that trade opinion is unduly influenced by a prejudice probably based on its comparative value with that of the other more popular species or on the fact that the supply of these in the past sufficed to meet the local demand. Its known defects are insufficient to debar it completely from use under conditions favourable to durability.

Judging from the absence of complaints against this timber, when properly converted, the war bases have presumably found it satisfactory for building works. This is somewhat negative proof, yet it has been used so largely in Military Works barracks in the Punjab and at Quetta that ample data as to its suitability can, if necessary, be obtained. The most remarkable example of its use in the new Grand Trunk Road bridge over the Haro, between Serai Kala and Campbellpur, in which the whole of the decking and part of the trestle-work is composed of Fir and Spruce supplied from Messrs. Spedding and Co.'s saw-mils at Jhelum.

It is also interesting that three English Saw-mill foremen who have visited these mills during the past year have expressed the opinion that there is no apparent difference between the Himalayan species and its European equivalent.

The suitability of Spruce for aeroplane construction was investigated by the aeroplane timber expert early in 1918, but his decision was unfavourable partly because of knots and partly because of short length. The only timber then available for inspection were some poor quality Kashmir Departmental logs and the ubiquitous beam from which nothing can be expected. There is little doubt, therefore, that the decision passed was premature. The Spruce logs which arrived subsequently from Messrs. Spedding & Co.'s forests in Kashmir were of magnificent quality and undoubtedly up to specification; moreover, there is hope that some of the Kashmir forests at least can supply logs of the desired length even under the present methods of extraction.

The matter is worth further investigation more especially as the Himalayan Spruce is the longest fibred of all Spruces. At the same time the specification is so severe that the production of aeroplane Spruce alone is at present not a commercial possibility but can be worked only as an adjunct of an ordinary lumber business. The prospect of the infinitesimal yield of suitable timber obtainable militated largely during the demand against any further investigations into the possibilities of working standing Spruce. The extent of wastage can be gauged by the fact that in the earlier types of aeroplane the amount of finished Spruce timber was 2[illegible] cubic feet to produce which over 150 cubic feet of selected Sitka Spruce planking was required.

Unfortunately, the increased output of this timber has been devoted almost entirely to military consumption with the result that its possibilities have not been introduced to Indian markets outside the Punjab. Nevertheless samples sent to Calcutta in 1917 and 1918 drew an offer for long length slabs of over Rs. 3 per cubic foot f.o.r. Calcutta or, say, about Rs. 2-8-0 f.o.r. Punjab. This is, of course, an inflated rate but affords some proof that Fir and Spruce could, with freightage preference under normal conditions, compete successfully with imported Japanese Pine in the markets of Northern India.

It is a remarkable fact that a timber, so well known in the British lumber trade, is hardly recognized in India outside the Punjab. It is understood that, in such adjacent territory as Sind and Baluchistan, Fir can be substituted for Kail or Chir without comment. In the Karachi market all coniferous lumber was till quite lately known as Deodar and demanded a special rate apparently based on the rates of sea-imports. Again, Ordnance factories know only of Deodar and Chir, other coniferous species being covered by the vague term 'deal'.

It is clear from this that the Panjab trader has been in the past blind to the existence of other markets than the Punjab bazaars, though a part of the blame is attributable to the petty quantities in which he deals, and to the high rates of railway freightage. It was not till a Bombay firm, early in 1917, had cornered the whole Deodar market, while another firm had, with considerable professonal enterprise, passed off a large quantity of Fir sleepers as a suitable substitute for Sal, that the local trader began to grasp the connection between his timber and the war. He has, moreover, little sense of combination or initiative and has therefore been an easy victim not only of his own failings, but also of the unsympathetic attitude of Government in meeting grievances which are often only too just.

For the promotion of trade Government activity is called for, and in this sphere the Kashmir Forest

Department has already shown great enterprise. Being unable to find a sale for its Fir and Spruce a lease was issued to Messrs. Spedding & Co. at rates sufficiently low to cover the initial expenditure of erecting saw-mills at Jhelum and to compensate for possible failures in the pioneer work contemplated. These mills have now been working for two years and have been of incalculable assistance to munitions supply. They give a monthly output of 1,000 tons lumber, and are fitted with additional machinery for finishing and joinery work. This example is both instructive and refreshing, and judging from the excellent and previously unknown quality not only of the logs exploited but also of the outturn, it is safe to predict the complete success of the Kashmir policy.

As indicative of the future policy of Government, the writer may be forgiven for emphasizing his firm conviction based on two years' experience of the timber which teaches the river depots and of the conversion of the same that it is only from long logs and large squares that satisfactory lumber of any description can be obtained. This applies to all Pine timbers but especially to the Fir and the Spruce, which are the only species in which a surplus for export exists. If this is accepted, it is clear that greater attention must be paid to exploitation. At present logs, and these mostly in short lengths, are to be found only on the Jhelum and Indus rivers, while the vast majority of timber is brought down in the form of more or less carelessly converted and often shattered scantlings of 10″×5″, 10″×6″ and 12″×6″ section in lengths from 9′ 6″ (Railway sleeper) to 16′. The production of timber in this form is inevitable under the present difficulties and methods of extraction, but if allowed to continue will retard the development of the Punjab lumber trade. Special stress is laid on this point because the true interests of the trade are apt to be clouded by the present and possible future high rates to be procured on the market and the danger that the Forest Department, owing to these rates, will either do nothing or will allow its attention to be diverted to interfering, under the semblance of pioneer work, in commercial activities which are not part of its true function and for which it is in no way fitted.

The greatest assistance which Government can now give in the development of the lumber trade lies in the improvement of all processes of conversion, extraction and grading up to delivery of the timber in the sale depot. These improvements, at least on the Beas and the Sutlej rivers, are believed to involve severe engineering problems and heavy expenditure on permanent works, all of which are obviously beyond the capacity of the forest contractor. His existence is, in fact, a menace to trade development, and it will not be till the whole of his work has been taken over by Government with the honest intention of carrying out these improvements, not with the object of pocketing his profits, that progress will be made. The advantages derivable from the retention of such a monopoly by Government are too obvious to be enumerated.

In this connection the opinion of an officer for some time in the early part of the war responsible for Indian timber supplies to war bases is valuable as an independent summary of the situation:

"If only India could supply more seasoned timber and timber in better lengths, the work would be much easier, but Government seems to have systematically starved the Forest Department so that there are no means of drawing out big logs and all the business seems to be in the hands of petty traders."

COCOANUT GAS AND COKE.

We take the following from the *Mysore Engineers Association Bulletin* for April, 1919:—

Those who have happened to see a cocoanut shell burning need not be told how beautifully and rapidly it burns away. After the shell has been heated to a certain extent and has begun to emit smoke in considerable quantities, if you throw a burning match into it the gas takes fire and burns brilliantly, the shell shooting forth the gas in noisy streams. Nature seems to have concentrated the gas-giving elements in the nut shell so that they rush out at a feeble call from fire.

If we heat the shell of a cocoanut in a gas retort and collect the gas, it burns quietly in a Bunsen burner. I heated 3.5 oz. of the shell and obtained 700 cubic inches of gas. By heating the same quantity of the husk, *i.e.*, the outer fibrous covering of the cocoanut, almost the same quantity of gas was obtained. Calculating from these we may expect that the shell and fibre of an average sized cocoanut, when subjected to destructive distillation, can yield gas which under atmospheric pressure will fill not less than 2,500 cubic inches of space or about 2½ ordinary kerosine tins. Tar and an oily liquid are also produced. Though the quantity of tar produced here is not so great as in the case of coal gas, yet it is not inconsiderable and may prove a useful and valuable by-product. The oil, our Physicians say,

has a great virtue as the healer of long standing sores.

Out of the shell and fibre heated, only about 35 per cent, is left behind in the retort as coke, whereas even the best coal, is said to leave behind as much as 60 per cent as coke. This shows that the gas value of the shell and the fibre is even greater than that of the best variety of coal.

The "Shell-Coke" is of a fine deep bluish black colour. Crushing the shell coke into a fine powder and mixing with linseed oil I have used it as a black board paint. The black board covered with this paint presents a smooth deep black surface and can be used for all practical purposes in the school room. The fine powder of the shell coke can be used in the preparation of black paints and may probably prove to be a good substitute for lamp black.

The gas burns with a fairly luminous flame before passing through water and with a non-luminous flame after it is made to pass through it. In this connection we must remember the fact proved by Berthlet, Dittmar, Frankland and Thorne that the illuminating value of coal gas depends on the presence of benzol vapour, and the vapour is soluble in water. Probably there is only a small quantity of benzol vapour in the cocoanut gas and even this is dissolved when the gas is made to pass through water. Wood gas is largely used in Germany, Switzerland and Russia where wood is more easily obtained than coal. Even in the case of wood the illuminating power was originally very small and was later on increased, by passing the products of low-heat distillation through a range of red-hot pipes or by properly heating wood in ordinary retorts fed with small charges and by burning the gas at considerable pressure in specially constructed burners. If it is granted that the Cocoanut gas can be obtained in an industrial scale, and it is an useful and valuable industry, want of luminosity of the flame is not an insuperable obstacle since the gas can be made to burn brightly by what are known as Carbaretting processes which are generally adopted to increase the illuminating power of the ordinary coal gas to render non-luminous combustible gases, as water gas, luminiferous and so to load non-combustible gases with hydro-carbon vapour as to make the combination at once luminiferous and a supporter of combustion.

In Malabar, Ceylon and the Laccadives the cocoanut trees are so numerous that the shell and the fibre of which a very large quantity is left behind after being used for coir making are burnt as fuel. In various parts of Malabar, Cochin and Travencore the most frequently used form of fuel is the cocoanut shell. That there is plenty of the shell and the fibre of gas making seems to be certain if the gas is to be used for lighting or in working gas engines. Even a slight increase in the price of the cocoanut products must be an incentive or the greater cultivation of this most beautiful and wonderful tree, which, as the earthly representative of the Divine *Kalpavriksha* has been specially given to India and the East.

May I request those who have greater facilities for carrying on experiments to produce the gas on a large scale and try to increase the luminosity of the flame by any of the processes used for the purpose.

ECONOMIC EFFECTS OF PEACE TERMS.

The *Berliner Tageblott* summarises as follows the economic effects of the surrenders of territory required by the Peace Terms:—

AGRICULTURAL LOSSES.

Grain, Roots and Pulse.—Exact figures are available for the provinces of Posen and West Prussia. Both districts had a surplus supply of agricultural products which were available for other districts of Germany. According to the last census, the population of the two provinces was 4·06 millions, or some 6 per cent of the total population of the Empire. But their yield in agricultural produce represented a proportionately greater share of the total German production. Thus, for wheat it was 7·3 per cent, for rye 16·5 per cent, for barley 13·3 per cent, for oats 7·7 per cent, for potatoes 15·6 per cent, for sugar-beet 19 per cent, for pulse 20·2 per cent, for summer straw 9·3 per cent, for winter straw 13·7 per cent, and for hay 7·4 per cent. East Prussia, too, which may, if the plebiscite goes against Germany, lose certain districts, was a surplus-yielding area. The province as a whole produced 5·69 per cent of the total German production of bread grain. To these losses must be added Upper Silesia, Alsace-Lorraine, and in certain eventualities Slesvig, which are either amply self-supporting, or in parts surplus yielding areas. Taking the lost territories as a whole, the German Agricultural Council calculates that not less than one-quarter of the German production of bread grain and potatoes will be lost, while the diminution of population will only represent 10 per cent or a little over, of the total population.

Cattle.—The provinces of Posen and West Prussia, with a population representing 6 per cent of the total German stock; while their stock of milch

cows represents 8 per cent of calves under three months, 6·6 per cent of pigs, 9·3 per cent of sheep, 11·7 per cent of poultry and 8·1 per cent of the respective German stocks. East Prussia and Slesvig are also surplus-yielding districts for meat and milk. Reckoned in terms of calories, Posen and West Prussia can supply 5·4 million persons with a daily ration on a pre-war scale of 2,550 calories, whereas their population is only 4·06 million. Separation of these provinces, therefore, means that food (bread grain, potatoes, sugar, butter, and meat) must be brought from abroad for 1·4 milliom persons.

INDUSTRIAL LOSSES.

Coal.—The industrial losses are no less serious. Germany's total coal output in the last year of peace was roughly 190,000,000 tons. Of this the Saar district yielded about 13,000,000, Alsace-Loraine about 17,000,000, and Upper Silesia about 49,000,000. The total loss in coal involved in the separation of the provinces is therefore equivalent to about one-third of the total pit coal output. The Westphalian coalfields, which yield the best European coke, are indeed left to Germany, but clauses are included in the Peace Treaty which considerably restrict her freedom to dispose of this coal for her own purposes. She is placed under the obligation to supply France with 7,000,000 tons of coal a year for a period of ten years, and, in addition, is to supply an amount equivalent to the difference between the annual output of the North French Mines before the war and their actual output in the year in which the delivery is made. This last quantity is not, however, for the first five years to exceed 20,000,000 tons, in the second five years 8,000,000 tons. On the average, therefore, Germany will have to supply France with 22·15 million tons of coal a year, to which must be added 8,000,000 tons a year to Belgium for ten years, and 7,000,000 to Italy for five years. The net result of these obligations is to commit Germany to the delivery of some 37,000,000 tons of coal; and this will have to be deducted from the output remaining to her, which in the years immediately following the war will not regain the pre-war level. The total coal export in 1913 was 34·5 million tons, while on the other hand there was an import of 10·5 million tons. Unless, therefore, Germany can very considerably raise her output, the loss of Upper Silesia and the Saar basin, together with the fulfilment of the remaining obligations formulated in the Treaty, will render necessary a very much larger import of British coal, or a considerable reduction in consumption. A possibility of making good some portion of the coal deficit might possibly be provided by an increase in the production of lignite, which the Treaty leaves almost completely in Germany's hand-

Iron.—The loss of Alsace-Lorraine carries with it the most serious effects on the German iron industry. The full significance of Lorraine is by no means brought out by a mere comparison of the steel output of the provinces (2,286,354 tons in 1913) with the total German output of 18,958,919 tons. The point of decisive importance is rather that not only the Lorraine works themselves but also the remaining West German iron establishments, especially those in Rhenish Westphalia and the Saar basin, cover their ore requirements to a very arpreciable extent from the Lorraine mines. In 1913 the Lorraine and Luxemburg iron mining industry contributed to the extent of 28·5 million tons to the total German ore output of 35·9 million tons, and in respect of iron content supplied 8·15 million tons out of a total of 10·54 million, *i.e.*, it supplied not less than 77 per cent. The loss of Lorraine would therefore make Germany dependent for the greater portion of her iron production on foreign ores, of which in 1913 she imported about 14,000,000 tons, with an iron content of 7·7 million tons. It is no doubt true that after the war it will still be possible to obtain ores from Sweden, Spain, and Russia—perhaps also even from France; but the ore basis of the German iron industry would nevertheless be so greatly restricted that a disproportion would arise between raw material and industrial product which would render the continued existence of the industry on its former scale a matter of doubt.

Zinc.—The position of the German zinc industry will also present serious difficulty. The loss of Upper Silesia involves that of the greater porton of the German ore supply, together with all the foundries which work up these ores with the assistance of Upper Silesian coal. It is sufficient to call to mind the names: Giesch's Successors, the Silesian Zinc Foundries, Ltd., and the Hohenlohe Works, to obtain an idea of what the loss of Upper Silesia would mean to this industry. The West German zinc indnstry, on the other hand, which is concentrated primarily in the three great works—the Rhenish-Nassau Mining and Foundry Co., the Stolberg Zinc Foundry, and the firm of Berzelius, remains practically unaffected by the cession of certain districts to Belgium. The ore mines of these works remain German. It should, however, be remembered that these firms are precisely those which in the years preceding the war were obliged to have increasing recourse to foreign ores to cover their requirements; and that in the meantime German zinc contracts, especially with Australia, have been annulled by the British and Australian courts. What has been said of the zinc industry itself applies also in the main to its bye-products, which, especially sulphuric acid, are valuable basic materials for

the chemical industry. They also apply in the main to the lead industry.

Potash.—It is well known that the German monopoly in potash is broken by the return of Alace to France. A total of 14 works are thereby separated from the German Potash industry. Their output of potash is about 6 per cent of the total German output. Their real productive capacity is, however, much greater than this, and was only kept down to 6 per cent of the German output by the system of syndication. Their production could be considerably increased, and the extent to which they, and for that matter the Spanish works, are able to affect the foreign sales of the German potash industry has already been shown in the negotiations of the Potash Syndicate with England and America.

Petroleum.—Alsace possesses, in addition, petroleum wells belonging to the German Petroleum Co., Ltd. In peace time they yielded about 42 per cent of the total German output of some 120,000 tons. During the war the completion of the conversion of the Pechelbron Works to an improved system doubled the Alsatian petroleum output, the advantage of which now accrues to France.

Other Industries.—To all the above raw material industries must be added many manufacturing industries, among which the following may be mentioned; in Upper Silesia, the cement, chemical, textile and spirit industries; in West Prussia, the timber-using, sugar, milling, distilling agricultural machine and shipbuilding industries; in Alsace-Lorraine, the leather and textile industries, especially cotton spinning, the machine industry, milling, vine growing, and wine production.

The paper concludes that a country deprived of such immense productive resources will find it impossible both to bear its own war debts and to pay the tremendous indemnities demanded from it. Such an achievement is made the more unlikely in that the provinces to be separated from Germany are under no obligation to take over any share of the German war debt, and in certain respects are even to be indemnified by Germany.

SPEECHES AND PRONOUNCEMENTS.

INCREASE OF FOOD SUPPLIES IN MYSORE.

The following order of the Government of Madras, Revenue (Special) Department, (G. O. No. 1303, dated 7th July 1919) has been issued as a Press Communique:—

It is well-known that owing to the war and the unfavourable season during faslis 1327 and 1328 a serious situation has been created in India by reason of the reduction in the stocks of food supplies that has resulted. The Government of India have taken steps to conserve the existing stocks and to increase the supplies by stopping exports from India except under license to certain countries with a considerable Indian population and by arranging for imports from other countries, while measures have been taken to see that the best use is made of the deficient rolling-stock on railways by controlling movements of goods by rail. Arrangements have also been made for the import of rice into India proper from Burma at controlled prices. The export of rice from Burma during the first four months in 1918 to destinations other than India was 716,363 tons, but in the first four months of the current year the exports for those destinations were only 286,100 tons. The export of wheat during the first four months in 1918 amounted to 175,268 tons and to only 2,739 tons in the corresponding period of 1919. From January to April 1918, 412,818 tons of other food grains were exported, whereas during the same period of the current year the export of the same food-grains amounted to 45,426 tons. On the other hand large quantities of rice have already been received from Burma and considerable quantities of wheat from Australia and further consignments are expected.

2. So far as this Presidency is concerned arrangements have been made for the import of rice from Burma and for the import of rice, and Bengal-gram from other provinces in India. Against a monthly allotment of 30,000 tons of Burma rice for the Madras Presidency including Cochin, 1,96,344 tons were imported under licence in the half year ending 30th June 1919. The continuance of these measures will, it is hoped, provide this Presidency with sufficient suppllies till the next harvest.

3. The effects of the war were not felt in the Madras Presidency during the first three years to

the same extent as in other countries taking part in it. Other countries have had to take and are still taking far more serious measures for the conservation and replenishment of their food supplies than have hitherto been found necessary in India. Even with the signing of peace the normal conditions in the world will not be restored immediately: the transport of goods must be temporarily restricted owing to the continuance of the effects of the destruction of ships and the wearing out of railway rolling-stock until they can be replaced. While therefore in normal times the Madras Presidency is practically self-supporting in the matter of food-supplies, it is of importance that everything possible should be done to increase the yield of food-crops in fasli 1329 both to provide a sufficient supply for consumption during the fasli and to recoup the reserve stocks in the Presidency which are now reduced. The Government have had under their anxious consideration the means by which they may be able to increase the yield of food-crops. The object of the present communique is designed to set out their proposals for the information of the public and to enlist the effective co-operation of the people of all classes to the same end.

4. There are three principal ways in which the yield may be increased:—

(1) The yield obtained per acre cultivated may be increased.

(2) The effect of damage due to pests may be mitigated.

(3) The area under cultivation may be increased.

5. There is a little doubt that the most potent factor in the variations of yield of crops throughout the whole of India from year to year is the weather. The fall of 770,000 acres in 1915-16 as compared with the preceding year in the total area under food-crops throughout India was ascribed to the fact that weather conditions were not altogether favourable owing to a weak and irregular monsoon and inadequate and untimely winter rains: an increase in the following year of 5,340,000 acres (the total area under food-grains being 209,075,000 acres) was ascribed to the fact that the monsoon during the year was particularly good; it arrived early and continued late, the distribution of rain being remarkably uniform. In 1917-18, in the Madras Presidency the total area under paddy was 11,655,302 acres, *i.e.*, 123,600 acres more than in the previous year; on the other hand the yield of the crop was 9,203,329 tons, *i.e.*, nearly 30,000 tons less than in the previous year.

6. It is the constant endeavour of the Government to ensure that crops on as large an area as possible are made as independent of the distribution of rain as practicable. One method by which the protected area can be extended is by the construction of wells. The Government have made special inquiries with the object of facilitating the sinking of wells by means of State loans. They have sanctioned the employment of a special staff including a deputy collector and four revenue inspectors for the Ceded Districts and special establishments for the districts of Salem, North Arcot, Chittoor, Madras, Trichinopoly and Godavari. They have also decided that in order to encourage the grant of State loans for sinking wells an engineering staff equipped with an adequate supply of boring tools should be employed in each district to make trial borings and assist the ryots with expert advice on the subject. The Director of Agriculture has been requested to pay special attention to the matter. The Government have further called upon the Board of Revenue to report what special staff will be required in each district for propaganda work and for the prompt disposal of applications for loans. Further the Government have relaxed the rule insisting upon separate applications and separate security under the Agriculturists' Loans Act and the Land Improvement Loans Act and have directed that a consolidated loan may be granted on a single security if it is sufficient.

7. The Agricultural department is engaged on researches into various questions connected with improved methods of cultivation with the object of obtaining a better yield per acre. The results hitherto obtained have been published in bulletins and demonstrated on farms; and ryots have in some places profited by the adoption of selected seed or improved methods of cultivation recommended by the Agricultural department. Much more, however, might be done in this way and the Government trust that wealthier landowners and ryots will spred the knowledge of the result obtained by the Agricultural department by getting into touch with the officers of the departments, visiting the Government farms and adopting under guidance and advice in portions of their own land the improvements which have been tested and found to be sound; thus they will not only obtain profit themselves but will demonstrate to their tenants and to poorer ryots the advantages of adopting the improvements. In this way larger yield may be obtained on land which is already cultivated regularly. It may be noted in this connection that with the prices that are at present ruling it will in many cases pay to increase the production per acre by the introduction of methods of cultivation or manures which in ordinary times landowners may hesitate to use on account of the expense involved.

8. A frequent source of damage to crops is the existence of pests. These are generally insect pests so far as cereals and pulses are concerned. Any ryot finding his crop seriously attacked by pests should at once draw the attention of the village officers to the fact; they in their turn should at once inform the Tahsildar or Deputy Tahsildar who without delay will send specimens of the plants attacked or of the insects doing the damage, if they can be identified, to the Government Entomolgist, Agricultural College, Lawley Road Post office, Coimbatore District. The manner in which specimens should be packed and the details to be given in the report to accompany them are explained in the Agriculture Calendar for 1919-20 (page 50). It is well known that attacks by pest may reduce the yield of the crop by a half and every effort should be made to deal with a pest before it establishes too great a hold on the crop.

9. The Government are also anxious that the area under cultivation of food-crops should be extended as much as possible. For this reason they have made the following concessions :—

(*a*) Dry food grains may be cultivated during fasli 1329 free of assessment on any unoccupied assessed Government land in the Presidency on which crops have not been raised during fasli 1327 or 1328.

(*b*) The Government are addressing the Railway Board with referrence to the cultivation of railway wastelands with food-crops for a period of three years from 1st July, 1919, free of assessment.

(c) During fasli 1329 the cultivation of dry crops may be permitted by Collectors in tank-beds subject to the following conditions :—

(1) No person shall be allowed to cultivate tank-bed land under this order unless he is the owner or cultivator of wet land in the ayacut of the tank.

(2) The tank-bed should not be monopolised by a few influential persons but should be divided among all the applicants qualified under the first condition in suitable proportions,

(3) The highest dry rate of the village should be charged on the area cultivated.

(*d*) Dry food-grains may be grown free of charge on backyards during faslis 1329, 1330 and 1331 up to an extent of 25 cents in each case.

(*e*) Miscellaneous cultivation under the Divi Pumping project has been authorized up to an extent not exceeding 38,000 acres.

10. In case of failure of the monsoon it will be more than ever important to raise as much food-grain as possible. It seems likely that in such an event much might be done to encourage the cultivation of dry crops on wet lands when the supply of water in a source of irrigation is insufficient for a full crop of paddy. In some cases a total amount of grain can be obtained which is little less than the full crop of paddy at a saving of more than half the water. The rules at present in force permit of this being done and every encouragement and assistance should be given to the people to enable them in the event of insufficiency of the supply of water to grow dry food-crops on wet lands. The local agriculturists are probably aware of the most suitable food-crop to grow on such land; for heavier soils cholam or korra will probably be suitable and for the lighter ragi or some of the smaller millets; pulses of different sorts can be sown alone or mixed with any of the above. If the ryots have any difficulty in obtaining seeds for dry crops the officers of the Revenue Department should endeavour to obtain supplies of seed for them on payment or to instruct them where seed can be obtained.

11. Notice has already been given of the necessity of as much seed-grain as possible. Seed-grain is grain which has been kept in a condition in which its vitality is preserved and which will therefore germinate. Grain for eating is kept in various ways some of which, *e.g.*, storing in pits, spoil it for sowing by killing the germ. It is possible that much of the seeds exposed for sale in the bazaar is capable of germination to a greater or less extent, and the Government Economic Botanist is prepared to test and report on any sample sent to him at the following address:—Agricultural College, Lawley Road Post Office, Coimbatore district.

12. The Government are aware that advantage cannot be taken of the concessions offered by them without some trouble and expense on the part of the people. The high prices of food-grains now prevailing should be in themselves some encouragement to the ryots to extend and improve their cultivation. The Government desire to appeal especially to the zamindars and wealthier landowners for their co-operation in the endeavour to ensure an unprecedentedly large yield of food-crops during fasli 1329, and to the educated classes to spread far and wide a knowledge of the concessions announced in this communique and of the necessity for increasing the yield of food-crops both on land which is now uncultivated and in place of the crops which are only useful as the raw material of industries.

INDIAN SUGAR-CANE INDUSTRY.

The Agricultural Research Institute, Pusa, has issued a Bulletin (No. 83 of 1919) entitled "progress of the Sugarcane Industry in India during the years 1916 and 1917" (Government Printing, India, Price five annas). It consists of notes submitted to the Meeting of the Board of Agriculture in India, Poona, 1917, edited, with an introduction, by Dr. C. A. Barber, C.I.E., Sc.D., F.L.S., Chairman of the Sugar Committee of the Board of Agriculture in India, 1917. We quote below the introductory portion of the Bulletin written by Dr. Barber:—

It has been the custom in the past to collect the mass of notes prepared on the special subjects discussed at the meetings of the Board of Agriculture and to print them as appendices to its Proceedings. When it was decided on the last occasion to abbreviate the Proceedings by leaving out most of these notes, and thus keep the bulky volume within reasonable limits and also issue it more expeditiously, the Agricultural Adviser was approached as to the possibility of printing the notes on the progress of the sugar industry as a Bulletin of the Pusa Research Institute. This form of publication is, after all, much more suitable, for the Proceedings are often not readily available and the information contained in the appendices is liable to be overlooked. Thus far the notes on the sugar industry prepared for each meeting of the Board have been preserved and it was felt that it would be a pity to break the continuity of the record. The Agricultural Adviser has kindly agreed to this suggestion and has asked me, as Chairman of the Sugar Committee, to edit the bulletin and write an introduction. The note on the work of the experimental factory at Nawabganj, in the United Provinces, is not printed here, as it has been issued as a separate bulletin.* No notes were received from Bengal and the North-West Frontier Province, but these have been subsequently prepared at special request, and are included with the rest.

On looking through the reports presented on this and previous occasions for discussions at the Board of Agriculture, the first thing that will strike any one interested in the progress of the sugar industry in India is the marked inequality of the amount of information recorded regarding different tracts, the amount of detail in no way corresponding to the importance of the work being done of the interests involved. This is, of course, partly a natural expression of the amount of personal attention given to the subject by the different authors of the notes. Some few of them are devoting their whole attention to sugar matters, while others have many other interests to engage their attention. Some of the notes have been written by chemists, botanists or agriculturists, and the point of view differs accordingly, whereas a number have been prepared by Directors of Agriculture, who are in charge of all the activities of their Departments, and cannot therefore be expected to possess the detailed knowledge of the subject which is desirable.

As instances of the meagreness of the information presented concerning important tracts, the reports printed here of the Directors of Agriculture in the United Provinces and Bihar and Orissa may be specially referred to. In the former case, with a greater acreage under sugar-cane than the whole of the rest of India put together, the work of the Shahjahanpur Research Station is practically unnoticed, doubtless in part due to the absence of Mr. Clerke from India at the time. The whole of the cultural varietal work being carried out in the province is dealt with in one short paragraph, although, as will be seen later, the Director regards this as the most important part of the sugar work of the Department. In the report from Bihar, where the greatest number of the sugar factories in India are collected, no reference is made to their work at all. This will naturally be read as an indication that the Agricultural Department is not in touch with them; but a very much fuller and more useful report might have been presented by the Agricultural Chemist, who has devoted much time to sugar matters and done a good deel of useful work on the subject. The Bombay note contains no reference to the extremely promising and important extension of the sugarcane area in the tracts of the Deccan now being opened up by the new system of canals, although a newspaper cutting was afterwards added, at special request, by the Director of Agriculture, containing a summary of his evidence before the Indian Industrial Commission. The Burma note contains no information as to the progress of the Government scheme of opening up a new sugarcane area in the Mon Canal region. But instances need not be multiplied to demonstrate the very partial nature of the information placed before the Sugar Committee by the local authorities. The Committee expressed itself freely on the subject,[1]

*Agricultural Research Institute, Pusa. Bulletin No. 12.

[1] Proceedings of the Board of Agriculture in India, Poona, 1917, page 78.

and a general study of the material printed in this bulletin will furnish a strong condemnation of the system at present adopted, as it no longer meets the needs of the case. What is wanted is a much more thorough study of the industry from all points of view, and this bulletin presents a powerful argument for the formation of the Bureau of Sugar Information which the Board of Agriculture proposed should be started, consisting of specialists whose whole time should be devoted to the various aspects of this important industry throughout India.

That the sugar industry in India is in need of immediate attention is agreed to everywhere, and that this is fully realized by Government is obvious from the remarks of Sir Claude Hill in his opening address at the Poona meeting of the Board of Agriculture.[1] It is instructive to note the somewhat divergent views which are held, by different authorities, as to the special defects which are held to be fundamental, and which should be immediately attended to if any hopes of improvement are to be entertained. The process of manufacture of the raw product is admittedly of a very primitive nature and although there is a steady improvement in many places, it is the belief of some that this is the limiting factor which must be attended to before any improvement can be hoped for. This point of view is a century old, and recently been specially advocated by Mr. Sayer in a series of articles in the *Agricultural Journal of India.*[2] The principles of *gur*-making are undoubtedly in many places woefully wasteful, if not radically wrong. But is not this point of view to a certain extent influenced by the translation of *gur* into white sugar? The ryot prefers this *mixture*, and is even content to pay a higher price for it than for the pure white sugar. Looked at from this point of view, the loss in manufacture is perhaps somewhat exaggerated. The cultivation accorded to the sugar-cane in a large part of India is also extremely primitive. For its improvement, much propaganda work is needed by the Agricultural Department, but this is complicated by the facts that it is extremely difficult to alter, by example or precept, agricultural practice which is firmly rooted, and that the treatment of the canes in the tropics is largely inapplicable to the canes grown in India. It is the opinion in some quarters that, before the cultivation is improved, it is comparatively idle to attempt the introduction of better varieties. Thus, in his note for the United Provinces, Mr. Hailey writes: "The main work of the Department is concentrated on teaching the people better methods of planting and cultivation, and it is believed that when these are more generally in force the introduction of better classes of canes will necessarily follow; but, until adopted, the best results will not be obtained from the work on the research farm in this province or that at Coimbatore." Lastly, the kinds of cane grown all over the great sugar-cane tract of India are easily the worst in the world, and it is believed by some that this is the basal defect in the industry and that, if better kinds are forthcoming, they will be readily taken up by the cultivator, and that improved cultivation and manufacture will be more likely to follow, when the increased production places the ryot in a better financial position. This is the object with which the Coimbatore farm was started. There is no doubt that the great expansion in the sugar industry in the Madras Presidency, during recent years, is mainly due to the good new kinds of cane introduced through the agency of the Samalkota farm in the Godavari District, and nowhere is this more forcibly exhibited than in the fine sugar factory at Nellikuppam in the South Arcot District.

There three lines of improvement are being continuously studied in all places where the Agricultural Deparment interests itself in the improvement of the sugar industry, as will be sufficiently obvious if we read between the lines of the various notes brought together in this bulletin. Which direction of work is the more urgent will depend largely on the locality and the conditions of the industry in it, but the general question is of more or less academic interest, for all three are being simultaneously followed in each province. It is, however, none the less a defect that these efforts are detached and independent, little being known in one province of what is being done in another, what methods are being adopted and what lines of work have been found to be most successful. And it is this fact that has led the Board of Agriculture unanimously to support the suggestion of the Sugar Committee that an Imperial Sugar Bureau should be formed, whose duty will be to collect and collate the results obtained in various directions, and thus to be in a position to assist the isolated efforts in different parts of the country with sound advice, based on experience gained by a general survey of the work done in India now and in the past, and that accomplished in other countries.

[1] Proceedings of the Board of Agriculture in India, Poona, 1917, page 19.

[2] Volume XI, Parts I and IV; and Volume XII,

AGRICULTURAL DEVELOPMENT IN EGYPT.

According to the *Board of Trade Journal*, the following review of recent developments in the Egyptian agricultural industry has been supplied by the Egyptian Ministry of Agriculture :—

Horticultural Show.—An exhibition of flowers and fruits was held in Cairo in November. One of its special features was to demonstrate the wide possibilities offered in local fruit prodution, and the display of fruit was thus very instructive.

An exhibition of home-grown quinces, a fruit so largely imported for jam-making, attracted great interest. The yield from good varieties was 25 kilogs. per tree or a minimum return of £ E 40 per acre. This shows that even at pre-war prices the local production of fruit would pay handsomely.

Timber.—The country has passed through great difficulties to provide for its timber supplies during the war. Foreign imports were entirely cut off after the outbreak of war, and the country had to depend on its own resources. Timber was required for a variety of uses—building purposes, fuel, the making of industrial and agricultural implements, etc.

Building was very considerably restricted, but the other needs were heavy, and it was feared that the local supply might not be sufficient to meet them, as the country is very poor in forests. Fortunately such has not been the case. The use of home-grown timber has thus enabled wood-workers to appreciate the good quality of certain trees of which they were previously ignorant. As a result of the war many millions of seedlings of quick-growing species have been planted.

Vegetables.—The army requirements of vegetables have been considerable, and it was feared at one time that not enough could be grown in view of the difficulties of obtaining vegetable seeds from abroad. Special measures were taken to ensure against this contingency, and the supply of vegetables has been adequate for all needs. Marketing is, however, very unsatisfactory, as the returns to the cultivator from his market-garden produce are much below the retail prices.

Production of Citrus Fruits.—The prospects of this season's crop are generally good in Upper Egypt, but unsatisfactory in Lower and Middle Egypt.

It is noticed that fumigated plants are bearing more heavily than those not so treated, and it is hoped that the conclusion of the war will lead to the popularising of the practice of fumigation, by making it easier and less expensive to obtain the necessary materials. This is the only practicable method of controlling the scale insect, which at present constitutes the chief obstacle to the spread of citrus cultivation in Egypt. Lime trees are less subject to injury than orange and mandarine and are remuneratively grown, but the fruit production is too small for export. Improved varieties are, however, being propagated by the Ministry of Agriculture with a view of reducing the period due to elapse before they commence bearing. By using grafted plants, it has been possible to reduce the period by two years at least.

Bureau of Commercial Intelligence.—A bureau of commercial intelligence was started in the Ministry of Agriculture in September, 1914, for the purpose of furnishing information connected with Egyptian agricultural products for export, and with reference to markets for imported products, the bureau acting as an intermediary between the producer and the consumer. Samples of produce are prepared for submission to inquirers in all parts of the world, and information is supplied to producers to enable them to prepare their produce in a manner suitable for foreign markets.

Manures.—During the war, Egypt had to depend on her home production of cereals, and the need for nitrogenous manures was thus keenly felt.

The application of nitrogenous manures to the wheat crop in Egypt results in an increase of from 1½ to 2 ardebs, or 7 to 10 bushels per acre.

During 1913 more than 60,000 tons of these manures were imported, resulting in a probably increased production of 5,000,000 bushels of grains. A similar increase would result in the amount of straw. A shortage of nitrogenous fertilisers was thus bound to have a serious effect on the supply of grain.

With the end of the war there should be a favourable opportunity for the introduction of nitrate of lime. Experiments made have proved its efficacy, inasmuch as the land of Egypt already contains small quantities of soda.

Superphosphate had began to be imported before the war, but the quantity is insignificant as compared with nitrogenous manures. Should a demand arise, however, this manure can be manufactured locally, seeing the large deposits of mineral phosphate in the country.

ECONOMIC NOTES.

AGRICULTURE.

The Bombay Department of Agriculture, in its Leaflet (No. 9 of 1918) deals with the cultivation of Cape Gooseberry or Tiparee. The following is taken from it:—

One of the fruits which appears to have a very great future in Western India is the Cape Gooseberry or Tiparee. It is grown on a fair scale in Northern India, and a few of the Poona *malis* cultivate the crop. When it appears in the wholesale market it is immediately bought for despatch to Bombay where it is much appreciated.

The Cape Gooseberry plant is a shrub, three to four feet high, and about four to five feet wide. The fruit is a berry about the size of a *bor* or *jujube* fruit, and is enclosed in a hollow, yellow, dry and papery cover (calyx). It contains a slightly acid pulp with many small flat seeds.

The flavour of the fruit is excellent. Even those who do not care for it very much when they first taste it, come to like it later on. Excellent jam can be made from it. A kind of sweet pickle is also made out of it which, however, does not keep as long as jam does. Many Mohamedans and Bohoris mix this fruit in their preparations of meat. Since the fruit is put to use in various ways, it is expected to become very popular when once its usefulness becomes widely known.

The following information about its culture is, therefore, published for the benefit of cultivators:—

Soil.—The soil need not be very rich, but very poor shallow soils are not suitable. All soils in which brinjals, tomatoes and potatoes thrive are well suited to the Cape Gooseberry also.

Preliminary Preparation of the Land.—The field should be brought into good tilth and manured before the rains. Ridges and furrows five feet apart should be made by means of the plough for purposes of transplanting seedlings.

Manure.—The land should receive 20 to 25 cart-loads of farm yard manure per acre before planting. If the farm yard manure is not good, a topdressing of poudrettee (one ton per acre) fish manure or oil cake (800 pounds per acre), or sulphate of ammonia (200 pounds per acre) may be applied at a distance of nine inches from the base of each plant and thoroughly mixed into the soil, when the plants have grown about eighteen inches high.

Seeds—Rate and Seedlings.—In the month of June seed should be sown in lines in seed beds each six feet long and three feet wide. Three such seed beds will give enough seedlings for one acre. One quarter oz. of seed costing 6 annas will give enough seedlings for one acre.

As the seed is very small and as crowded seedlings kill one another, the seed should be mixed with eight times its volume of soil before sowing. The mixture should be sown in lines. The resulting seedlings will grow vigorously and a fair way apart from one another.

Transplanting.—Seedlings are fit for transplanting when nearly nine inches high. The seed bed should be flooded with water the day before lifting the seedlings. On removal they should be kept in a basket in bunches and water sprinkled upon them to prevent drying till required in the field. Two seedlings nine inches apart should be planted in each spot. Each clump of two such seedlings should be five feet apart. The furrows made for the purpose should be well-soaked with running water, some time before commencing actual transplantation.

Irrigation.—Unless there has been a shower or even a drizzling of rain at the time of transplanting, water should be given soon after transplanting. Afterwards the field may be irrigated once in eight to fifteen days according to soil requirements. Any shortage of water-supply after the fruit is set interferes with the proper swelling of the fruit.

Sub-crops.—Some early vegetables may be planted as sub-crops to Cape Gooseberries. Turnips, beet, tomato, lettuce, chillies, knolkhol, palak, or other vegetables may be grown. These crops should be planted so far apart as not to interfere with the operation of ridging up the main plants, which operation has to be done from one to two months after transplanting. Or else the sub-crops should be such as can be harvested before that time.

Ridging up.—This operation which is similar to that for ridging sugar-cane should be done when the plants are about a foot and a half high. The soil between the lines of plants should be dug up and heaped along the lines so that what were originally furrows are now transformed into broad ridges. If enough manure was not incorporated into the land in the beginning it may be mixed with the soil before ridging. Irrigation channels will now be formed between the lines and along each side of them. This operation shelters the roots from any possible exposure to the sun and provides convenient room between the lines to enable easy collection of berries.

Weeding.—It will be necessary to weed the plot a fortnight after planting. Afterwards about two more weedings in the whole period of the crop may be

needed both to stir the soil round the plants and to kill obnoxious herbage.

Pinching.—If the plants present a tendency to grow straight up, their leading shoots should be pinched back, when the plants have grown over a foot high. The plants will then throw side shoots and become spreading and bushy.

Flowering and Fruiting.—Flowers begin to appear with the advent of the cold weather, say about November, and fruits begin to set soon after. At Christmas ripe fruits are available. The best crop of fruits is obtained in January and February. The first two pickings give fruits of excellent flavour and few seeds. The fruits ripening in March are small and very seedy. It is, therefore, not profitable to retain the crop in the field after March. A completely ripe fruit has a very dried up cover and in this condition it often drops on to the ground. The dropped fruit is sweet being fully ripe. This would be the proper condition in which to pick the fruit. But it is not always convenient and economical to do so and it is usually picked from the plants when the cover has turned just light yellow.

Sale.—The fruits must be sold or exported immediately after picking. Otherwise one has to incur loss on account of shrinkage in weight by keeping.

Produce.—Each clump of two plants will yield from 1 to 2 lbs. (or from half a ser to one ser) of fruit. One acre contains 1,750 clumps and, therefore, the yield will come to 900 to 1,700 sers per acre.

Market Price of Fruits in Poona.—The market price of the fruit in the Empress Gardens, Poona, varied in the course of the last fifteen years from 4 to 10 lbs. per rupee according to the demand. In the Poona City market, the wholesale dealer has paid for these fruits at rates which varied from 4 to 10 lbs. per rupee.

Disease.—The Gooseberry has usually very little trouble from any diseases. Occasionally there is an attack of mildew which has rarely done any damage at all. Sometimes a caterpillar is seen cutting the leaves, but it dies away in the cold weather. Rats and civet cats sometimes give trouble.

Altogether we have, in the Cape Gooseberry, a crop which is well worth the attention of progressive cultivators, who have irrigation facilities, and who are near the railway or a good market. Under these circumstances the crop will yield a large return and well repay the attention it demands.

INDUSTRIES AND COMMERCE.

INDIAN AND COTTON COMMITTEE.

Government of India Resolution.

The following resolution has been issued in the Revenue and Agriculture Department :—

In their resolution, dated the 27th September, 1917, the Government of India appointed a committee to investigate the possibilities of extending the growth of long-stapled cotton in India. The terms of reference to the committee were that it should examine the work which had been done in the various provinces in the establishment of long stapled cottons and report regarding the possibility of the extension of any methods which had led to success, that it should investigate the causes of failure where this had occurred and if it found the failure to have been due to agricultural, irrigational or economic causes or to administrative difficulties, that it should propose appropriate remedies. The committee was also instructed to carry out a detailed study of local conditions in each cotton growing tract, to enquire into the possibility of improving existing methods of ginning and marketting and also of preventing adulteration and damping and to report on the possibility of improving the accuracy of the cotton forecasts and generally of making the statistical information published by Government of greater utility to the cotton trade. Finally, the committee was to submit recommendations in regard to the staff required and the organization necessary for the development of the cultivation of long-stapled cottons in tracts which it considered suitable for that purpose.

The committee assembled early in October, 1917, and toured in the cotton growing areas of British India and Indian states for five months. It examined numerous witnesses and in addition to visiting almost all Government farms in the provinces in which cotton is grown, it inspected a large number of ginning and pressing factories and spinning and weaving mills and also held many informal meetings with cultivators, ginners, brokers, representatives of co-operative societies and other persons concerned with Cotton. The results of these enquiries are embodied in the report which has already been published and of which the Government of India have now completed preliminary examination. Some time must necessarily elapse before the numerous recommendations contained in the report can be dealt with finally but the Government of India desire to take this opportunity of acknowledging the services of Mr. J.

Mackenna, president of the committee and his colleagues and to indicate broadly the lines on which it is proposed that the disposal of their recommendations should proceed.

The Committee has divided its report into two parts, in the first of which it has made a detailed local study of agricultural practice, irrigational development, research and marketting in the various provinces and Indian states.

The recommendations made in this part of the report are mainly a matter for disposal by the local authorities concerned and the Government of India are disposed to confine their intervention to larger matters of general policy or principle and to questions affecting more than one province for the present. The only matters dealt with in this part which the Government of India think it necessary to reserve for further examination are the following:—(*a*) investigation of the supplies available in the Indus and other Punjab rivers (a separate reference will be made to the Government of the Punjab on this subject) P; (*b*) the policy of granting to capitalists land on the new canals connected with the Sukkur barrage project; (*c*) the appointment of an additional mycologist to the staff at Pusa; (*d*) the imposition of a cess on all cotton used in Indian mills or exported to provide funds for the additional agricultural staff proposed. Should the Government of India find it necessary on further examination, to take up any other matters of general principle a separate reference will be made to the local Governments and administrations concerned. Subject to the above reservations they are prepared to leave to the discretion of local Governments and administrations the adoption of the various recommendations in chapters II-XI of the report, it being understood that a prior reference to the Government of India will be made in all cases which require their sanction under the ordinary financial rules. In particular, they desire that no time may be lost in considering the recommendations of the committee in respect of additional appointments in the agricultural department. They have recently addressed the Secretary of State for India regarding the requirements of the different provinces except Burma, for which no proposals have as yet been received, but their recommendations were submitted prior to their examination of the Cotton Committee's report which proposes the addition of a considerable number of appointments, especially on the botanical side. They, therefore, desire that this matter may be taken up at once by the local Governments and administrations in order that the Secretary of State for India may be asked as soon as possible to sanction such further appointments as may be considered necessary.

The second part of the report is devoted to the commercial side of the problem and comprises in the main recommendations of general application which it will be primarily for the Government of India to deal with. They are, therefore, undertaking a detailed examination of these recommendations in so far as this has not already been done, precedence being given to the proposals in Chapter XIX for the formation of a central cotton committee as in the event of such a committee being instituted, its advice will be of great value in assisting the Government of India in the disposal of the remaining recommendations, particularly those in chapter XVI of the report which is devoted to commercial matters and embodies perhaps the most important and difficult questions which the committee was called upon to investigate. The precedence given to chapter XIX will not, however, preclude the concurrent examinations of the recommendations contained in the other chapters: in particular, the question of licensing, ginning and pressing factories which is suggested in paragraph 225 of the report will be accorded special priority. Some progress has already been made with the proposal for the formation of a central cotton trade association in Bombay, a matter which is dealt with in chapter XVIII. The draft of the scheme foreshadowed in paragraph 255 has been received from Mr. Wadia to whom and to Mr. Glazebrook who collaborated with him, the acknowledgements of the Government of India are particularly due, and pending its detailed scrutiny, a Cotton Contracts Committee has already been set up in Bombay. Local Governments and administrations will be addressed in due course when the Government of India are in a position to place before them their considered views.

BOOKS IN BRIEF.

The Principles of Citizenship.—*By Sir Henry Jones. Messrs. Macmillan & Co. Ltd., London and Bombay. 3sh. 6d.*

To those who have read Sir Henry Jones' *The Working Faith of a Social Reformer* his present work will not come as a surprize. His standpoint is, as may be guessed ethical in this book and we think rightly so. He, however, does not dogmatize. He *suggests* rather than propogate his own views. This is just the method that should be adopted in writing on a subject like "Citizenship." The reader's consciousness is awakened and is enabled to think, nay fully led into *thinking*. Sir Henry justly insists that the moral truths which have practical power in a man's life are those which he discovers anew for himself. True citizenship is realized only when the ethical ideas on which it is based are grasped and acted upon. The progress of democracy-true democracy—so much depends on this that it is small wonder that only a citizen of England which is the one country which can successfully point to success in modern political history and Empire building on thoroughly sound ethical lines that can point the way *to* success in the great experiment of the future citizenship within in a Demorcracy. The book is likely to prove a great corrective to many mistaken notions about matters of particular moment to this country where the ideas relating to liberty, State interference, natural rights, obligations of State, *etc.*, prevail. We hope that it will attract the attention of the several University Boards of Studies. The book is eminently one fitted for study by students taking Political Science in our Universities.

The New Tariffism.—*By the Rt. Hon. T. M. Robertson, M. P. Published by Gewge Allen and Unwin Ltd., London. 23'6d. nct.*

This is a reasoned critism of the Balfour Committee's Report on the commercial and industrial policy that England should adopt after the War. Since Mr. Robertson wrote preference of a kind has been adopted in England and the Premier has recently promised a kind of protection to key industries. Despite all this, it is clear that opinion in England has been slow in veering round to the extreme views propounded by the Balfour Committee. Mr. Robertson's eloquent plea against its recommendations shows that free trade is not likely to be killed so easily as some people imagine. The prosperity of England has been too long bound up with free trade for the people to give it up easily. We do not think we can recommend a better book than Mr. Robertson's for a clear understanding of the extreme position taken by the Balfour Committee in regard to certain matters.

Beginnings of South Indian History.—*By S. Krishnaswami Aiyangar, M. A. Published by the Modern Printing Works. Rs. 3-12-0.*

This contains the substance of the course of special lectures delivered by Mr. Krishnaswami Aiyangar before the Madras University—January and February 1918. It deals with aspects of South Indian History which may be better understood when we note down the chapter headings:—Research in Indian History; The Value of Literature; South India—a Distinct Entity; Mauryan Invasion of South India; The Dawn of the Christian Era; Chronology; Tamil Literature; The Age of Purnas, etc. The value of contributions of this kind cannot be denied, whatever critics might say. Every attempt at elucidation of the dim past of South India,—or India as for the matter of that—ought to be welcomed. Mr. Krishnaswami Aiyangar would be the last to say that what all he writes is either correct or the last word on the subjects on which he has written. But critics should pass lightly over the shortcomings of a work of this sort and see to the light—given the little light—they might shed on the periods to which they relate. The value of publications of this kind lies entirely in the interest they evoke in the subjects to which they relate and the accretion of workers they secure to the field of research. It is easy to be too critical in matters of this kind, but criticism to be of use should, we think, be always helpful and constructive. We will only add one word in regard to the book itself. We would like it to be cast in a less polemical mould. Polemics is good in its own way, own sphere, but in a book of this kind it is, in our opinion, out of place. In revising the book for a future edition it would gain in value if the author rewrote some of the chapters in which the controversial air is far too predominant.

Governance of India.—*By K. T. Shah, B.A., B. Sc., Bar-at-law. Published by Ramachandra Govind & Son., Kalbadevi Road, Bombay. Price Rs. 3.*

This is a commentary on the Government of India Acts of 1915 and 1916. We rather like the form of this book, though it has certain inconveniences. Professor Shah writes as an Indian publicist and his views, where they differ from those of authorities of high repute, are fair. The commentary to each section or groups of section is clear and the exposition of the principles underlying it or them leaves little to be desired. Professor Shah, we are glad to note, does not, at the same time, spread himself out unnecessarily. The book is, therefore, both readable

and informing. The publishers, Messrs. Ramachanda Govind & Son., deserve praise for their excellent get up.

The Future Government of India.—*By K. Vyasa Rao, B.A., Published by Messrs. Macmillan & Co. 12s. net.*

The Reforms scheme of Lord Chelmsford and Mr. Montagu has been preceded and followed in India by an amount of propagandist work that is truly phenomenal. In the war of speeches and pamphlets that the occasion has given rise to, very little, perhaps, will remain of permanent use. But despite their ephemeral character, they have sought to influence public opinion one way or the other. This book, however, does not stand in the same category. It, perhaps, might claim a wider set of readers, and when the storm of discussion that is now on has spent itself out, it will still be turned to for useful suggestion. The author says that he has attempted to take up the mechanisim (of Government) as it is and has tried to bring out its inherent potentialities, leaving it at the same time responsive to necessary changes in the near future. The book is, therefore, largely constructive in character, though it is fearless in criticism of existing defects. This is as it should be. We note Sir S. Subramania Iyer, has read the proofs of the book and has spoken approvingly of it. He is, perhaps, one of the greatest legal luminaries of India and his opinion ought to carry great weight. When he states that the book is a "contribution" to the subject of Indian Reforms, he is not merely voicing his own opinion but that of many others in this country.

The Sepoy. *By Edmund Candler.—John Murray, London. 7sh. 6d.*

Mr. Candler deserves to be congratulated on this graphically written book. From cover to cover it is full of human interest. The sixteen different types of Indian soldiers who fought under the British flag in Mesopotamia are pictured for us here. The characteristics of the men, whether as individuals or as fighters, are brought out with Mr. Candlers' known skill. It is interesting to recall the fact that the best fighters of India are amongst its best cultivators—producers of material wealth. This fact has again and again been brought home to us as we read this book. The Jat, the Mahratta and many another tribe or caste may be cited. Mr. Candle's descriptive account deserves to be widely read all over the Empire.

RECENT PUBLICATIONS.

The Selection and Training of the Business Executive. *By Enoch Burton Gowin. 7¾×5½, xiii.+225 pp. Macmillan & Co. 8s. n.*

Income-tax. *How to Aviod Overcharges and Obtain Repayments. By A. D. Macmillan, formerly surveyor of taxes. 8½×5½, 61 pp. Effingham Wilson.*

The Training of a Salesman. *By William Maxwell, Vice-President of Thomas A. Edison, Inc. (Lippincott's Training Series.) 7¾×5, 221 pp. Lippincott. 6s. n.*

Problems of National Education. *By Twelve Scottish Educationists with Prefatory Note by the Right Hon. Robert Munro, K. C., M. P., Secretary for Scotland. Edited by John Clarke. 8¾×5½, 368pp. Macmillan. 12s. n.*

Suggestions of Modern Science Concerning Education. *By Herbert S. Jennings, John B. Watson, Adolf Meyer, and William J. Thomas. 7½×5, vii.+211pp. Macmillan & Co. 5s. 6d. n.*

The Measurement of Intelligence. *An explanation of and a complete guide for the use of Stanford revision and extension of the Binet-Simon intelligence scale. By Lewis M. Terman. With an introduction by Professor J. J. Findlay. 7½×5½. xi+362 pp. 6s. n.*

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Commercial Forestry in Britain *Its Decline and Revival. By E. P. Stabbing. 7½×5½. vi. +186 pp. Murray. 5s. n.*

The Safety of the Nation. *Showing how our security rests upon our industries. By Jan D. Colvin. 7½+5, xii+241 pp. Murray. 6s. n.*

Influenza. *A discussion opened by Sir Arthur Newsholme, K. C. B. 10×7, 102 pp. Longmans. 3s. 6d. n.*